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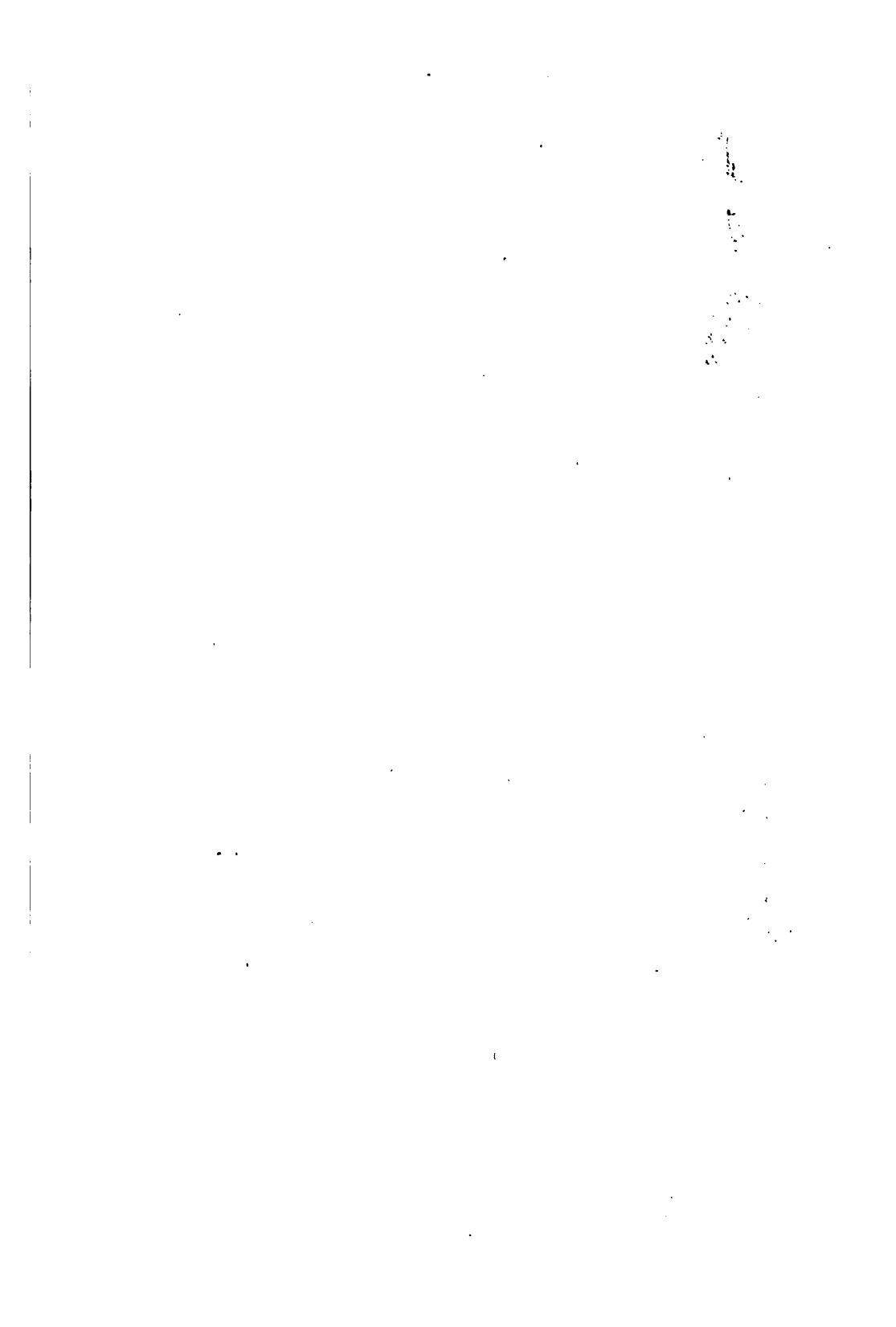
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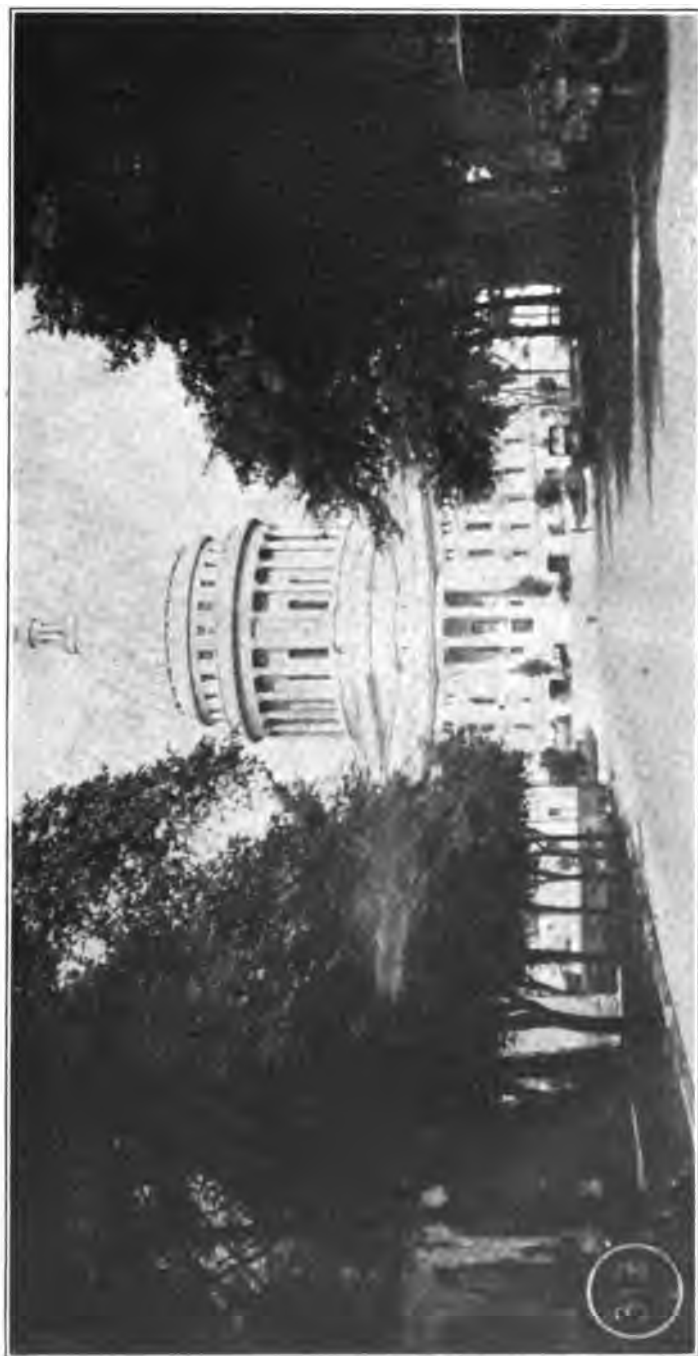


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FROM

The Commission





WISCONSIN'S STATE CAPITOL

Connected with every part of the state by the State Trunk Highway System. A fitting symbol of the spirit of the State.

WISCONSIN HIGHWAY COMMISSION

FOURTH BIENNIAL REPORT

SHOWING STATE AID HIGHWAY
OPERATIONS

Under the Supervision of the
WISCONSIN HIGHWAY COMMISSION
From January 1, 1916 to January 1, 1918

Containing also preliminary estimates of State Aid Highway
Work, Federal Aid Highway Work and State Trunk
Highway Maintenance to December 31, 1918.

MADISON, WISCONSIN

Published by the State

December, 1918.



WISCONSIN HIGHWAY COMMISSION

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LETTER OF TRANSMITTAL

TO HIS EXCELLENCY, EMANUEL L. PHILIPP,
Governor of Wisconsin.

SIR: In accordance with the provisions of Subsection 11 of Section 1317m—2 of the Statutes, the Wisconsin Highway Commission herewith presents its Fourth Biennial Report, covering completely State Aid highway operations in the calendar years 1916 and 1917, and giving preliminary estimates of operations in the calendar year 1918. There is also an account of the operations under the State Trunk Highway Act and tabular statements giving a full summary of the state's highway activities.

The Commission desires again to express its appreciation of the many courtesies and of the assistance rendered it by the State Chief Engineer and all other state officials. The Commission cannot lose this opportunity of thanking also its employes, the county highway commissioners, the county state road and bridge committees, and other county officers for the painstaking efforts all have made to wrest a victory out of adverse general conditions. Without the help of all of these, the results achieved would have been impossible.

Respectfully submitted,
WISCONSIN HIGHWAY COMMISSION.



FIG. 1. Patrol maintenance on Trunk Highway No. 33, Sauk County. The patrolman has made a single trip down the center of the road.



FIG. 2. The same road as shown in Figure 1, after two full round trips. The center of a road dries more quickly than the edges, therefore, the patrolman's first trip after a rain, with either the road grader or road planer, should be on the center. The road should be dry enough so that the material will move freely along the blade of the grader or planer and fill the ruts. After the center has been thoroughly smoothed and the ruts filled, the patrolman should start at the outer edge of the travelled way and move a small amount of material in toward the center of the road, as shown. It is never good practice to make the first trip after a rain with either grader or planer along the outer edge of the road. Traffic will always follow the smoothed portion and when once started along the edge of the travelled way it is difficult to get the traffic back to the center of the road where it really belongs.

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FOURTH BIENNIAL REPORT

OF THE

WISCONSIN HIGHWAY COMMISSION

Covering State Aid Road and Bridge Construction for the Calendar Years 1916 and 1917, with a Preliminary Report of Operations in the Calendar Year 1918, Together with a Report of Operations Under the Federal Aid Law and the State Trunk Highway Act.

INTRODUCTORY

The Third Biennial Report of the Wisconsin Highway Commission gave a complete report of the operations of the Commission during the calendar years 1914 and 1915, with a preliminary statement of work done in 1916. This, the Fourth Biennial Report, gives a complete statement of the operations of the Commission during the calendar years 1916 and 1917, with a preliminary estimate of the operations in 1918.

The final accounts of the construction in each calendar year are not received and checked until about May of the succeeding year; so that each Biennial Report appearing, as it does, about January 1, can contain only a preliminary statement of the work accomplished in the calendar year just preceding its appearance.

On January 1, 1919, the Commission will have completed seven and one-half years of existence and will have supervised seven years of actual construction under the state aid highway law and one and one-half years of supervision of federal aid highway operations and one year of federal aid construction.

During its existence, the Commission has supervised the construction of 6,200 miles of state aid roads, costing \$20,500,000; 1,497 state aid and 2,523 county aid bridges, costing \$5,200,000; also \$1,500,000 of federal aid construction and maintenance, and \$750,000 of miscellaneous

work. The cost of all work supervised, therefore, reaches the imposing total of \$27,950,000.

Despite the handicap of our entrance into the war, consistent progress has been made during the past two years. It will be noted from the construction tables that construction in 1917 was less than in 1916 and that 1918 showed a further considerable decrease. Due, however, to the foresight of the Legislature in complying with the federal aid enactment and creating a state trunk highway system for maintenance under state control, with adequate funds, the condition of the main roads in Wisconsin has undoubtedly materially improved in 1918.

This improvement is very gratifying in view of the decreased construction, and we know of no other way in which it could have been attained except by turning ourselves, as we did, to an aggressive maintenance policy which took comparatively few men and practically no materials at a time when both men and materials for construction work were extremely scarce and high.

The legislature of 1917, in addition to enacting the Federal Aid Law, made some changes in the State Aid Law (Sections 1317m—1 to 1317m—15, inclusive, of the Statutes). The principal effect of the changes made in the State Aid Law was to concentrate fifty per cent of the state aid construction, together with the attendant county and town funds, upon the state trunk highway system. This concentration on the state trunk highway system, along with the expenditure of the joint federal, state and county funds on this system, will undoubtedly in a very few years serve to wipe out most of the worst impediments to travel on the state trunk highway system, so that with adequate maintenance on the stretches in fairly good condition and with this adequate reconstruction of the bad stretches, Wisconsin may expect to have in a very few years a reasonably satisfactory system of main traveled roads.

The remaining fifty per cent of state aid, it was provided by the legislature, must be expended in the units of government unbenefited in any year by improvements made on the state trunk highway system. It was the idea of the legislature that those towns and villages which did not have the state trunk highway system should be given a fair proportion of the state aid funds.

While the small state aid appropriation makes the funds accruing to the unbenefited units rather small, the law allows the counties to multiply these funds as far as they see fit, and with a better understanding of this so-called second fifty per cent distribution, the counties are much better satisfied with it.

The last biennial report opened with a number of brief statements in regard to various phases of the road problem in Wisconsin. These articles were well received, and it is the purpose to repeat the same method of discussing the present problems in this biennial report. The articles will be found immediately following, and are as follows:

1. WORK OF THE BRIDGE DEPARTMENT.
2. THE PRESENT HIGHWAY LAWS OF WISCONSIN.
3. THE FEDERAL AID HIGHWAY LAW.
4. FEDERAL AID PROJECT IN 1918.
5. EXPERIMENTAL ROAD WORK OF THE COMMISSION.
6. THE UNDERLYING PRINCIPLES CONTROLLING THE LAYING OUT, MARKING AND MAINTAINING OF A STATE TRUNK HIGHWAY SYSTEM.
7. MAINTAINING THE STATE TRUNK HIGHWAY SYSTEM.
8. THE ROLL OF HONOR.
9. RECOMMENDATIONS TO THE GOVERNOR AND LEGISLATURE.

At the end of the report will be found complete tabular statements of the operations in each county in 1916 and 1917, and also various tables summarizing by counties the work done under the direction of the Commission.

In this report the Commission has continued its policy of showing a considerable number of illustrations giving some idea of the general scope and character of the work in Wisconsin. Due to the lack of appreciation of this phase of highway work by some of the county highway officials, many counties are not represented in the showing of pictures. An effort is made to show new and characteristic work, however, rather than to show pictures from each county of work involving no especial features. Probably the outstanding feature of this collection of pictures is the many artistic bridge structures shown. If previous reports of the Commission are examined, it will be found that the character of design and the workmanship on bridges in Wisconsin has shown a very marked advance. Some may criticise the expense and trouble involved in designing and producing sightly bridge structures, but if concrete structures are long lasting (and they are) it would seem that their proper building and ornamentation is well worth while.

An effort has been made to keep down the size of this biennial report in the interest of the conservation of paper and funds. It is believed, however, that all essential information is given and that anyone interested in the work in any county may find reliable information as to the county's accomplishments and can also review the present highway situation in the state as a whole.

Now that the war is happily ended there appears to be an overwhelming public desire to speed the construction and maintenance of highways, not only in Wisconsin, but in all states. The Wisconsin Highway Commission will make every effort to keep Wisconsin in the forefront in every worthy highway effort. Care will have to be exercised to control the coming expansion so that the public will not be led astray by wrong standards of construction and fail to get value for its expenditures. This Commission feels very deeply its responsibility to the people of Wisconsin and will endeavor to continue to justify the confidence which is reposed in its personnel and activities.

THE WISCONSIN HIGHWAY COMMISSION.

Madison, Wisconsin, Dec. 1, 1918.

WORK OF THE BRIDGE DEPARTMENT

The duties of the State Highway Commission as regards bridge work, and the organization of the bridge department, have not been changed materially within the last two years, and the statements made in the previous reports therefore apply in the main. Tables in the back of this report give the detailed figures of county and state aid bridges surveyed, designed and built. The total number built (4,020) at a cost of over \$5,200,000 gives an idea of the amount and scope of the work of the bridge department.

There has been a great improvement in the character of the work done, both as regards design and construction. The most striking development has been the practical abandonment of the use of steel construction in common use since the decline in the use of timber, and the large scale introduction of a superior construction material,—reinforced concrete.

REINFORCED CONCRETE BRIDGES

The use of reinforced concrete construction on a large scale is of comparatively recent origin, beginning about the year 1900. Its use in highway bridge construction began about the year 1905. The Highway Division of the Geological and Natural History Survey, the forerunner of the Highway Commission, was organized in the year 1907 and the use of reinforced concrete for bridge work was advocated from the beginning. However, the public, at that time, was skeptical about the utility of this material, finding it difficult to understand how reinforced concrete construction, particularly flat slab bridges, could hold up against loads, while the strength of steel beams was self-evident. To make the problem of introducing reinforced concrete still more difficult, at that time it cost appreciably more than steel construction of like capacity. It is not difficult to understand the reasoning of the average Town Board, in those days, when asked to purchase an unknown material, of whose serviceability they were skeptical, at a higher price than they were required to pay for a material which they knew and preferred.

The State Highway Commission and its engineers, however, continued to advocate the use of reinforced concrete on the ground of its superiority and there was some response. The first good sized reinforced concrete girder bridge built in the state, of which the Commission has knowledge, was a 36 ft. span built in the Town of Sand Creek, Dunn County, in the year 1909. It is significant that this town,

which was required to build another bridge of approximately the same size the succeeding year, would not consider anything but the same type of construction. The following year a few more reinforced concrete bridges were built and during succeeding years construction of this type slowly but surely increased.

During the early years the advantages of reinforced construction were not as plainly evident as they are at present due to the inferiority of the work done at that time, both in the way of design and execution. As has previously been stated any considerable use of reinforced concrete for highway bridges in America does not date farther back than about 1905. It began in this state about 1909. Hence it can readily be seen that at the time the Highway Commission began advocating its use in 1907, that the experience in the use of this material, both in the way of design and construction, was not great. Designs which looked well on paper did not work out so well in the field. It was also difficult to secure implicit adherence to plans. In many cases where the designs were worked out with care, the builders, with the sanction of local authorities, omitted all architectural details calculated to improve the appearance of the work. The absolute futility of attempting to build enduring concrete bridge work with any material except the best was not fully realized by those paying for the work, and it was impossible to avoid the use of cheap local materials in cases where the cost of the proper shipped in materials added appreciably to the cost of the work.

But the Highway Commission continued its efforts in spite of discouragements, and there was progress, gradual in the early days, but increasing. The successful construction of hundreds of small span reinforced concrete culverts and bridges on state aid highway construction influenced public opinion greatly. Here and there, some town board, more than ordinarily courageous, began to experiment with comparatively long spans of the new material. Generally the results were distinctly gratifying, in a few instances distinctly disappointing. But in these cases the reason was not far to seek and readily explainable. In one case a large girder span collapsed immediately when the forms were removed. In that case it was found that the contractor had taken steel bars bought of the exact sizes and lengths shown on the plans, cut them to pieces and placed them in the bridge in full accordance with his own ideas, but in complete variance with the plans, and with all other applications of the principles of engineering design. This occurrence caused considerable pessimism in that locality, which became optimism when the bridge was rebuilt, this time in accordance with the plans. In some parts of the state there was distinctly encouraging progress, even as early as 1913 there were a few counties where the construction of a short span steel bridge was unusual. The leaven introduced by the Highway Commission was working and when the time became ripe, the public was prepared for a rapid change.

The rapid change from steel to reinforced concrete construction in Wisconsin began in the year 1916 and was largely the direct result

of the rapid increase in the price of steel due to growing war requirements. The low record price of steel bridges occurred late in the year 1914. At that time the State Highway Commission designed several large steel highway bridges which were contracted at a price of approximately 2½ cents per pound for the steel erected. This price held practically without change until midsummer 1915, when a slight upward tendency became apparent. There was a rather sharp increase in the fall of 1915. The increase became rapid during 1916, until late in that year structural steel, which had been sold two years previous for about \$36.00 per ton from stock, was quoted in the neighborhood of \$100.00 per ton. This price continued to hold until the government price was fixed at approximately \$60.00 per ton. But with this price fixed, delivery became very slow unless purchases were made from stocks, and in those cases high prices held.

Under these conditions it became advantageous to build with the minimum quantity of steel. The use of reinforced concrete construction generally decreased the quantity of steel required by more than 50 per cent, and permitted the use of the kind of steel (bars) most readily obtainable. Since about March 1917, reinforced concrete bridges have actually been cheaper even in first cost, foot for foot, than steel bridges of like capacity. Under these conditions it has been much easier for local authorities to see their advantages, and the increase in the use of reinforced concrete construction has been very rapid.

In the meantime the experience of the State Highway Commission in design, and of the various bridge builders of the state in construction, have also borne fruit and the result is that the work built about this time has been much superior to the work previously done, both in design and execution. The advantages claimed for the reinforced concrete construction became so plainly evident as to require no further demonstration.

It is very rare at the present time that a short span steel bridge is built. The use of reinforced concrete bridge construction, particularly in short spans, is well understood by a large number of practical bridge builders; the local authorities have become acquainted with a high class of construction, appreciate its superiority, and demand the best. While it is likely that the return of normal conditions will reduce the cost of steel so that steel bridges will again be built at a lower first cost than reinforced concrete bridges of like capacity, it is believed that the general use of structural steel for the construction of short span steel bridges is a thing of the past in Wisconsin.

In facing the future there are a number of considerations which we must bear in mind, as follows:

1. While all work that is now being done is of a fairly high class, it is capable of improvement and must be improved. The best is none too good.

An examination of some of the concrete work done five or six years ago will reveal that it has crumbled and disintegrated, particularly at the water line. This is the result of inferior or improperly propor-

tioned materials. All concrete is more or less porous and therefore absorbs water, which on freezing has a tendency to expand. If the weather is cold enough and sufficient water has been absorbed into the concrete, disintegration will be rapid. Therefore it follows that to avoid this disintegration concrete should be as dense as is possible, built of the very best materials, and most carefully proportioned and mixed. The use of improper materials will often make an appreciable reduction in the first cost of a bridge structure, but such bridges will not stand, deterioration will result, and the ultimate cost of the bridge structure will be much increased.

The uninstructed are often afraid of the quality of the cement but take no heed of the other ingredients of the concrete. The fact is that the manufacture of cement has now reached such a state of perfection that the cement is usually the most reliable material entering into the work. Beware of inferior sand and stone, and see to it that clean water is used.

2. Beauty in permanent bridges, particularly in concrete bridges, is just as important as utility. This means that there must be the greatest of care, both in the design and execution of all bridge work.

Particularly within the last two or three years the State Highway Commission has paid great attention to the question of appearance. In some cases we have been criticised for paying too much money for "looks." We have no fear of such criticism and speak very confidently on this subject because in precisely those communities where these criticisms occurred, there is now the strongest demand for work of the very best appearance. It should be borne in mind that concrete is built for permanence and therefore good appearance is all the more necessary. An ugly object is an offense to every passerby, therefore in ugly highway bridges permanence ceased to be a virtue. We can stand for ugliness in temporary construction, but not in construction that is expected to be permanent.

3. To secure the most efficient construction we must have the work executed by competent and experienced builders, working under experienced supervision.

To those who have had experience in the use of reinforced concrete it has been demonstrated, beyond the possibility of doubt, that far from being a simple and easily worked material, concrete requires the most careful handling in order to secure the best results. While it may be possible for novices to secure good results on very small operations, it is impossible to secure the best results in the construction of a considerable structure, such even as small bridges, unless the work is carried out by those who are experienced and thus have understanding. Therefore, in letting contracts for any building work the skill and experience of the builder should be considered as well as his financial ability and his price bid. No work should be entrusted to any man unless there is assurance that the work will be carried out under experienced, skillful and competent direction. Even this does not remove the necessity of competent inspection through an inspector paid by the owner of the work. However reliable and trustworthy any contractor may be, it is human nature to give no more than is required

and the best of us are apt to waiver unless we have some spur to keep us pressing forward. Competent inspection is welcomed by the best contractors, and where unwelcome is doubly necessary.

The public, which formerly believed that inspection was unnecessary, or in any event could be made by some laborer working on the job and paid by the contractor, has now come to realize that inspection is well worth paying for.

4. The above requirements mean work that will be high priced in first cost though economical in the end. We must bear in mind that when we are building with reinforced concrete, we are building not merely for the present but for the future and should consider the satisfaction that is obtained in the long run.

We have stated that in order to secure the best results in the use of reinforced concrete, it is necessary that it shall be constructed by skillful, experienced builders working with the best of materials under competent supervision. It is impossible for anyone to gain skill in any particular operation unless he continues in that operation over a considerable period of time. In order that he can do this the work must be remunerative. It is an ancient truth that the laborer is worthy of his hire. The responsibility for 90 per cent of the inferior concrete construction, of which we see so much, can be traced to the fact that it was done by inexperienced builders who obtained contracts by underbidding competent experienced men who knew the cost of work. For this reason all of us who have to do with the direction of work of this class must harden our hearts against proposals from inexperienced bidders and refuse to permit inexperienced builders on important work. They should begin their operations with work of the simplest character and progress as they have gained experience. Unless we do adopt this course and allow fair, even liberal profits, we shall defeat our own efforts by driving the best class of builders from our work.

SPECIAL BRIDGES

As explained in the previous report, the legislature of 1913 enacted legislation which has been amended by each subsequent legislature, providing state aid in the construction of bridges necessarily more than 500 feet in length over navigable or meandered streams. The first bridge built under this statute was over the Wisconsin River in the Village of Nekoosa in the years 1915 and 1916. A description of this bridge is found in the preceding biennial report.

The second is a bridge built over the Wisconsin Channel of the Mississippi River in the Town of Trenton, Pierce County, at a point opposite the city of Red Wing, Minnesota. At this point the main channel of the river and the state boundary are close to the west bank.

Until the completion of the new bridge travel passed from the Town of Trenton into the City of Red Wing over a toll road and bridge maintained by the Red Wing & Trenton Transit Company, a corporation owned by the city of Red Wing. This company owned and maintained the bridge over the main channel of the Mississippi, half in each state.

and in addition one and three-fourths miles of road on an island, a bridge six hundred feet long over the so-called "back channel," and one-half mile of road on the mainland, all in the state of Wisconsin.

In the spring of 1916 the city of Red Wing submitted a proposal to the Town Board of Trenton, by which the city would abolish all tolls in consideration of the town's assumption of liability for the maintenance of the road in Wisconsin previously maintained by the city, and the construction of a new bridge over the Wisconsin Channel.

The town accepted the proposal and proceeded to construct the bridge under the provisions of Sec. 1321a, the work being completed in November 1917. The bridge as completed is six hundred feet long and consists of five equal spans. The roadway is twenty feet wide and paved with creosoted wood blocks. The construction throughout is substantial. The estimated cost was \$45,000, the actual cost \$44,673.18, of which the Town of Trenton, Pierce County, and the State of Wisconsin each paid one-third.

The legislature of 1917 enacted Sec. 1325k of the Statutes, providing for the maintenance of bridges over navigable or meandered streams which form the boundaries between counties. A bridge is now under construction over the Wisconsin River near Necedah under the provisions of this section. This bridge will be five hundred sixty feet in length, the roadway eighteen feet, and the construction substantial throughout. The estimated cost is \$60,000. The indications are that the work will be completed slightly under the estimate.

FUTURE WORK

The restrictions under which all construction has labored affected bridge work with the rest. The supply of two essential materials, steel and cement, was shut off just at the time construction was becoming active in 1918, and the partial removal of restrictions in October did not permit the undertaking of any new work. The consequence is that bridge work has been at a practical standstill during the last half of the year. With peace declared and the return of conditions approaching the normal, it is certain that there will be more highway bridge construction than ever before. There will be an immediate demand for the construction of bridges the construction of which has been deferred due to war conditions. The increasing travel due to the extensive use of motor vehicles will cause the replacement of many structures of moderate strength due to the inadequate width of roadways. In addition there will be the construction normally necessary to replace deterioration.

The State Highway Commission, which has been prominently identified with the bridge construction done in the state during the last seven years, feels that it will be called upon to design and superintend the construction of much of this future work. We view the future with confidence. We expect the same generous support we have had in the past, and with the growing demand for and appreciation of high grade work, we will design and build bridges of a standard equal to the best, and worthy of the highways of the State.

THE PRESENT HIGHWAY LAWS OF WISCONSIN

Wisconsin is engaged in systematic highway construction under two distinct plans. The first is the Federal Aid plan, under which the cost of construction is borne jointly by the Federal government, the State and the Counties. The second is the State Aid plan, by which the cost is borne jointly by the State, the Counties, and the Towns, Villages and Cities in which the various improvements lie. The two plans, while differing in details, are similar and the improvements made, though distinct, are coordinated. The following is a brief explanation of the methods by which they are administered and financed.

FEDERAL AID PLAN—As a result of the Federal Aid Law, enacted by Congress in July, 1916, each state receives a portion of a \$75,000,000 appropriation, the amount depending on the ratio of its area, population and mileage of rural post roads to the total for the United States. The total amount to be received by Wisconsin under this distribution is approximately \$1,925,000, to be expended over a period of five years. The State is required to appropriate at least an equal amount to be eligible to receive Federal Aid. The work is executed by the State, but must meet the approval of the United States Office of Public Roads.

The State Legislature, in the statute assenting to the Federal law and providing the machinery for administration (Chap. 175, Laws of 1917), made the required state appropriation from funds derived from the proceeds of motor vehicle license fees. The joint state and federal funds are distributed among the counties one-third each in the ratio of area, valuation and total public road mileage. In order to receive the amounts distributed from the joint Federal and State funds, the counties are required to provide additional amounts at least equal to half the joint state and federal funds. The result is that the cost of Federal Aid construction is borne one-third by each of the units concerned.

All improvements with Federal Aid must be located at points designated by the State Highway Commission on the State Trunk Highway System of 5,000 miles, which interconnects all county seats and cities with a population of 5,000 or more. On receipt of notice from the State Highway Commission of the amount required for a projected improvement, it becomes the duty of the County Board to provide the necessary county funds. Fifty per cent of the County's share of the cost, but not to exceed one thousand dollars per mile, may be assessed by the County Board against the municipality in which the improvement lies. The work may be executed either by contract or by day

labor, as the State Highway Commission may determine, subject to the supervision and approval of the U. S. Office of Public Roads.

STATE AID PLAN—The annual appropriation for State Aid is \$785,000, which is allotted to the Counties in proportion to their assessed valuation. The counties, in order to receive their allotments, must provide additional funds in the manner hereafter explained. All improvements with State Aid must be made on the County Systems of Prospective State Highways (which aggregates about 20,600 miles and includes the State Trunk Highway System) at points determined by the County Board. Not less than \$3,000 can be appropriated for any single improvement, unless it can be entirely completed for a less amount. The County Board may assess any amount not exceeding forty per cent of the County's share of the cost, as a special benefit, against the municipality in which the improvement lies.

The second half of the County's allotment is then distributed among the municipalities of the County, unbenefited by an improvement on the State Trunk Highway System, projected for the same season. The County is required to appropriate county aid in an amount at least equal to the amount of the State Aid, and to levy a tax against the municipality in an amount not greater than the County Aid nor less than the State Aid.

In the distribution of State Aid among municipalities, previous bond issues must be considered, as hereafter explained. The location of all State Aid improvements, and the type, is determined by the County Board. The plans must be approved by the State Highway Commission and the work done subject to its supervision.

FINANCES—As has already been stated, the cost of Federal Aid work is borne in substantially equal parts by the Federal Government, the State, and the Counties.

The U. S. Government's share is provided by an appropriation from "any funds in the treasury not otherwise appropriated." This means that payment is made from the general revenues of the Government. The State's share is derived from the proceeds of automobile license fees in the manner hereafter explained. The County's share may be provided either by a direct tax or by bonds. The most important features of the bond laws are discussed later in this article.

It has also been explained that the cost of State Aid work is borne jointly by the State, the Counties, and municipalities. Though there is a persistently prevailing idea that each pays one-third, this is not the fact; in reality the percentage paid by each unit may vary widely.

Another erroneous impression is prevalent among many officials who should know better that if a municipality makes an appropriation for State Aid work, the County and the State will provide like amounts. In fact, the amount of State Aid that can be received by any County is a fixed figure, depending on the amount of the State appropriation and the County's assessed valuation. The minimum appropriation made by the County to claim the first 50 per cent of its State Aid money must exceed this amount (50 per cent of the allotment) by at least one-half, it may be greater. Likewise, the sum available jointly

from the County and its municipalities must be at least double the second 50 per cent of the State Aid money. But exceeding these minimum allowances will not increase the amount allotted by the county for distribution.

The State Appropriation for State Aid for highways is made from the general fund of the State, which is derived from the taxation of public utilities, inheritances, etc. The County's share of the cost of State Aid work may be provided by the county either through direct taxes or from the proceeds of bond issues. The municipality's share of the cost of State Aid work must be provided through direct taxation, though contributions may be accepted by either counties or towns and applied in the same manner as an appropriation.

AUTOMOBILE LICENSE FEES

Mention has been made that the State's share of the cost of Federal Aid construction is defrayed from the proceeds of automobile license fees. An explanation of the disposition of the total funds derived from this source is therefore in order.

In considering the construction and maintenance program inaugurated by the passage of the State law assenting to the Federal Aid law (Chap. 175, Laws of 1917), the Legislature decided that a portion of the cost at least, could equitably be assessed against those who derived the greatest benefit from the contemplated highway improvements namely—the operators of motor vehicles. The license fees which had previously been fixed at \$5.00 per car per year were raised to \$10.00 per car per year, with greater license fees for trucks, varying according to the capacity. The net proceeds, remaining after the cost of collection including the cost of the license plates, were then disposed of in the following manner:

1. Twenty-five per cent of the net proceeds are returned to the counties in the proportion paid in by residents of the counties, to be used for the maintenance of the County Systems of Prospective State Highways. The total amount thus returned to the counties for the fiscal year ending June 30, 1918, was \$489,857.

2. A sum is then appropriated for the State Highway Commission to defray the expense of administering construction and maintenance on the State Trunk Highway System. The maximum thus available is \$80,000 per year.

3. From the amount remaining after payments due under 1 and 2 have been made, a sufficient sum is then appropriated to pay the State's share of the cost of Federal Aid construction. The amount used for this purpose during the fiscal year ending June 30, 1918, was \$381,232.00.

4. After all payments due under 1, 2, and 3 have been made the remainder is appropriated for the maintenance of the State Trunk Highway System and apportioned to the counties in proportion to their mileage of roads on the State Trunk Highway System.

The amount thus available for the fiscal year ending June 30, 1918, was \$1,008,339, which is \$201.71 a mile of the State Trunk Highway System. A discussion of the details of the maintenance work is found under the heading "State Trunk Highway Maintenance."

BONDS

The State Highway law provides for the issue of highway bonds by both counties and towns for the improvement of the Prospective State Highway System or of the State Trunk Highway System. The issue of Highway Bonds by the State is unconstitutional.

County bonds may be issued by action of the county board or by a popular vote. The maximum issue possible by the former method, at one session of the County Board, is two-fifths of one per cent of the assessed valuation of the county; the aggregate of such issues outstanding at any one time must not exceed one per cent of such valuation. County bond issues may be submitted to a popular vote at the regular April or November elections, either by resolution of the County Board or through petition of electors. The maximum issue under this plan is fixed by the Constitutional limitation (five per cent (5%) of the county valuation) upon the Counties to incur indebtedness.

County bonds may be used directly to provide the County's share of Federal Aid or State Aid construction, or, as is advisable, where the bond issue is large and the work done thereunder extensive, the amounts received by the County under the State Aid law may be applied toward the payment of these bonds.

All work done with County Bonds is subject to the supervision of the Federal Government, if the work is Federal Aid work, otherwise, the work is subject to the supervision of the State Highway Commission.

Town bonds for the improvement of the County System of Prospective State Highways may be authorized by a majority vote at town meeting. The proceeds of town bonds are not available to obtain State Aid, nor is any issue valid unless the County Board issues bonds for the same improvement in a like amount. The maximum issue possible is fixed by the Constitutional limitation on municipal indebtedness.

During the first years of the operation of the State Highway law, the proceeds of town bonds might be used to secure State Aid. Several towns had issued bonds prior to the amendment of 1917, which amendment provided that town bond issues could not draw State Aid. For the protection of these towns, who relied on State Aid money to meet their bond payments, the Legislature provided that in the distribution of State Aid allotments, the County Boards should set aside for such towns, to apply toward the payment of their bond issues, amounts not less than the average of the amounts received for this purpose each year since the bonds were issued.

SUMMARY—The similarity between the Federal Aid and State Aid plans is very striking. In each case we have the three units of gov-

ernment participating in the work. The second largest unit, in each case, determines the location and character of the improvement, and executes the construction, subject to the supervision and approval of the major unit. The major unit in each case offers a financial inducement to encourage construction and protects its interest by supervising the work.

In each plan the work is confined to systems of preferred highways; under the Federal Aid plan, to the State Trunk Highways System of 5,000 miles; under the State Aid plan, to the County Systems of Prospective State Highways aggregating approximately 20,600 miles. The first system includes roads which are of State and National importance, the second system includes the roads of County importance. All roads on the first system, practically are included in the second, the excess mileage being those roads not of importance outside of the immediate locality. Thus, all improvements with Federal Aid, are improvements to the County Systems of Prospective State Highways, and likewise, a large percentage of improvements with State Aid are on the State Trunk Highway System. The State Highway Commission is actively connected with both, in an executive capacity on the Federal Aid work, and in a supervisory capacity on the State Aid work. All improvements, with both Federal and State Aid, are thus coordinated, and jointly produce the systematic betterment of the highways of the state.

While each Legislature since the original enactment has amended the State Aid law, this has been in details and not in fundamentals. Public sentiment, at first skeptical, has become more and more favorable. It is therefore believed that the plan followed is fundamentally correct and will continue unchanged except in details.

THE FEDERAL AID HIGHWAY LAW

The Third Biennial report discussed the then new Federal Aid Law and its application to Wisconsin conditions. After the passage of the State Trunk Highway Act in conformity with the Federal law, Bulletin No. 6 of the Commission was issued giving the full text of the Federal Aid Law and of the State Trunk Highway Law, with a full review of their provisions. This material need not be duplicated here. We wish to briefly discuss, however, Wisconsin's experience with the federal aid highway law and the results which may be expected.

When it became known that the federal government had appropriated \$75,000,000 for highways, there seemed to be the common belief that the road problem of America was well toward solution. As a matter-of-fact, Wisconsin's share of the \$75,000,000 in five years amounts to only \$1,925,000. This sum multiplied by three, under the provisions of the State Trunk Highway Law, produces a fund of \$5,775,000 for construction in a four-year period. Adequate concrete roads today cost about \$20,000 a mile, and the total sum above mentioned will build about 288 miles of concrete road, which divided equally between the 71 counties would mean four miles of concrete road to the county.

It is, therefore, evident that the Federal Aid Act has by no means solved the highway problem for Wisconsin. The money produced by it will, however, if properly expended, go some way toward fixing most of the difficult places on the state trunk highway system and will wipe out many of the present real impediments to travel. It will only, however, serve to do this. As far as being any considerable help toward solving the statewide road problem, it is not.

It is true that the present national sentiment is to very much increase the appropriation made under the Federal Aid Act, and it is expected that after 1920 the annual appropriations will be at least \$50,000,000, which under the present distribution made by the federal aid act, would give Wisconsin about \$1,280,000 a year, which multiplied by three, would produce a considerable construction fund.

The benefit of the Federal Aid Act does not consist largely in the federal funds made available for construction, but in the standardization of the engineering work in the various states; the general impetus given toward highway improvement; and the directing of national attention to the great road problem.

If the reader will glance over the article on "Federal Aid Projects in 1918" he will find that a very large number of these projects had to be abandoned due to the impossibility of getting the work done or of get-

ting it done at a reasonable cost. Nevertheless, it is probable that Wisconsin got under way as large a share of its federal aid work as did most of the states. Owing to the plans now being ready, we expect to do a large number of these projects early in 1919, and when the postponed projects and the new projects, now being considered in practically every county, are completed, a very material improvement will have been made in the general condition of the state trunk highway system.

The importance of the federal aid work is not measured by the expenditures or by the mileage constructed. If it is remembered that in practically every case the work has been located on the worst pieces of road on the state trunk highway system in each county and that, therefore, the work will wipe out most of the bad hills and other impassable conditions on the system, the value of it will be more closely realized. The State Highway Commission has located this work without fear or favor in those places which needed it the worst. Many of the improvements are just at the county lines, where county effort and town effort has for years failed to remedy conditions of the gravest importance to through travel. Taken in conjunction with the location of the first fifty per cent of state aid improvements on the state trunk highway system, which locations, we are glad to say, the counties have to a considerable extent based upon the same broad principles of the general public good, the general improvement in the state system when the 1919 work is completed will be wonderfully marked.

The Federal Aid Law is fair; the distribution of the federal funds is fair; and when the initial operating difficulties are smoothed out, the general results will be all that were expected.

The principal drawback is the amount of time it takes to clear projects through Washington and the amount of "red tape" which must be unwound before the work is under way. These difficulties will doubtless be removed as the work proceeds.

There is, however, one grave difficulty which must be removed either by action of the national Congress or by the state legislature. The Federal Aid Act provided that a road, to be subject to improvement by the Federal Aid Act, should be "any public road over which the United States mails now are or may hereafter be transported." It was expected that the "may" in this sentence would permit the improvement of any public road. The solicitor of the Department of Agriculture, however, has ruled that, if no mail route now traverses a road, it must be clearly shown that very soon after the road is improved a mail route will traverse the road. This ruling has been a tremendous handicap. Rural mail routes travel out of various centers and return to them in circuits. Between any two points out of which mail is carried, even on the most important main lines, there is a gap of a mile or several miles not traversed by rural routes. More important than this, however, is the fact that in northern Wisconsin few rural routes have been established; in fact, there are some counties without one rural route. Therefore, on these gaps throughout the state and anywhere in certain counties it has been impossible so far to provide for

the expenditure of federal aid money, due to the absence of rural routes now and the improbability of their establishment in the near future.

There are two ways to meet the situation. One way is to have the Federal Congress amend the Federal Aid Road Act so that it will be founded on the "public welfare" provision of the constitution, rather than on the "post road" feature. This would remove the whole difficulty with the minimum trouble, as the improvement of practically any road could be considered as expedient for the public welfare. It has also been suggested that changing the "may" in the sentence quoted to "can" will solve this difficulty.

The only other way is for the coming legislature to amend the present state trunk highway act in regard to funds for construction. In order to produce a sizeable construction fund, the legislature of 1917 provided that the federal aid fund should be duplicated by the state and also by the counties. Therefore, we are providing three times the amount of the federal fund on federal aid construction rather than twice the amount, which is the minimum allowed under the Federal Act. It would probably be possible to so amend the state law that the federal fund would be merely doubled and so that the other one-third could be expended under the direction of the Highway Commission in building roads on the state trunk highway system on which there were no mail routes and on which reasonable expectation could not be shown. If it appears that no national relief will be granted by the coming Congress, it would be very advisable for the coming legislature to formulate some amendment which would enable the State Highway Commission to build these very important gaps and enable it also to build in certain counties where no expenditure is possible until the Federal Aid Act is amended.

This is a matter which could not be foreseen at the time the state act was formulated. We believe, and most of the states believe, that the interpretation of the solicitor is extra-legal, but seemingly his opinion is paramount and cannot be attacked. For certain counties, however, and for certain portions of all counties his ruling very much handicaps successful operations under the Federal Aid Act and some remedy must be found if certain of our counties are to get any share of the Federal or State funds available for state trunk highway construction.

FEDERAL AID PROJECTS IN 1918

During the season of 1918 plans were made for fifty Federal Projects in nearly as many counties. These jobs vary in size from small ones, costing as little as \$9,000.00, to some which run into six figures. However, for various reasons the State Highway Commission was forced to postpone the construction of at least half of these projects. In some cases the Commission did not feel that the jobs were important enough to warrant the expenditure of the sum asked by various contractors to do the work. In others, the results of the patrol maintenance placed the roads in such condition that it was not deemed necessary to spend the Federal funds at this time, as it was felt that traffic could be fairly well taken care of until after the war by intensive maintenance. The projects in detail by counties are as follows:

Ashland County: The Federal Project in this county is located on the Hurley-Ashland Road on the east side of the county. This project was to consist of nearly 8 miles of grading without any surfacing other than that obtained from the right of way. Plans were completed but were not approved by the Federal Office because of the lack of mail route on the project. This job has been temporarily abandoned until the mail route situation is bettered.

Barron County: The Federal Project in this county is a joint project with Washburn County, and consists of about 9 miles of grading located on the Spooner-Cumberland Road. Plans for this work were completed early in the season and met with the approval of the Federal Office. This job was advertised about the middle of July but satisfactory bids were not received on the Barron County section.

Arrangements were made early in August for the Barron County end to be done by day labor under the supervision of the county highway commissioner. This work is progressing with two crews at work and will probably be about two-thirds completed during 1918.

The bids received on the Washburn County section were satisfactory and the work was let to Mr. J. E. Talbot of Shell Lake, Wisconsin, who is at work on the job and will probably finish at least 50 per cent of it during 1918.

Total federal funds available on this joint project are \$31,061.24.

Brown County: The 1918 Federal Project in this county is one of the largest projects we have in the state. It consists of 3.8 miles

of concrete road located on the Green Bay-Appleton highway. Plans were completed at an early date and met with the approval of the Federal Government. Early in June the job was advertised and let to Garvey & Weyenberg Construction Company of Appleton, Wisconsin. The contract on the road section amounted to \$80,717.05, and the contract price for the concrete arch bridge was \$13,365.00. Total federal funds available on this job are \$80,994.54. The difference in the amount of the contracts and the amount of federal funds available was paid by Brown County in accordance with the requirements of the State Trunk Highway Act. This work was entirely completed in 1918.

Chippewa County: The Federal Project as outlined for this county in conjunction with Eau Claire County is the largest Federal Project to date. It consists of about 8.6 miles of concrete highway connecting the cities of Eau Claire and Chippewa Falls. Plans for this project was completed in May and sent to the Federal office. On this job, which consists largely of relocating the present highway, there are eight railway crossings eliminated. It was hoped to get considerable assistance from the various railway companies interested, but owing to the war situation they were unable or unwilling to do anything, and the job was postponed until after the war.

There is available in the joint funds \$173,000, which added to the funds expected from the railway companies, will undoubtedly suffice to complete the project.

Clark County: The first Federal Project in Clark County was the grading of about eight miles of road on the Owen-Abbotsford road. Plans were completed and the job advertised early in July, but no satisfactory bids were received. The county forces were not in a position to proceed with the work and the project was therefore abandoned until 1919.

Columbia County: The original Federal Project for this county was the improvement of the road east from Portage toward Wyoceana, along what is known as the causeway. Later in the summer, however, it was decided to relocate the road and abandon the overflow section along the river bottom and go east on the Pardeeville Road and cross the creek just north of the graveyard. Plans are practically complete on this section and the job will be advertised early in 1919.

Dane County: The first project in this county is the completion of 3.4 miles of 18 ft. concrete between the construction limits of the city of Madison and the concrete located in the Town of Middleton. This project is on what is known as the Madison-Middleton Road.

After the plans were completed and approved by the Federal Government this work was advertised early in June and contract entered into with Nicholas Quinn of Madison in the sum of \$77,761.00. Work was commenced early in August but owing to

great difficulty in getting cement the surfacing was not started until a much later date. Only about 3,000 feet of surface was completed in 1918. The road will be rushed to completion in early 1919.

The second 1918 Federal Project in Dane County consisted of the relocation and surfacing of 2.7 miles of the so-called Springfield Hill on the Madison-Sauk City Road. This job was to have been waterbound macadam treated with some type of bitumen. This job was advertised twice but in neither case were satisfactory bids received, and it was therefore abandoned until 1919. The joint funds available for this job are \$30,925.84.

Dodge County: The original Federal Project for this county consisted of over 4 miles of gravel and stone road on the Horicon-Mayville Road. Total funds available are \$29,924.16, but since satisfactory bids were not received at the letting in July, the job was abandoned until 1919.

For 1918 there was also proposed work on the Watertown Plank Road in conjunction with Jefferson County, this being along the county line. The funds for this job, as far as Dodge County was concerned, were properly raised by the county board but were not by the Jefferson County board. The plans were not completed for this work and it was abandoned until the financial situation was straightened out in Jefferson County. There was available for the Dodge County part the sum of \$12,000.00.

Dunn County: The first Federal Project in Dunn County consisted of grading about 5 miles of the Menomonie-Hudson road, for which there is available in joint funds the sum of \$15,043.53.

This job, like several others in that section of the state, was advertised early in July but satisfactory bids were not obtained. Since the county was not in a position to proceed with the work, the job was temporarily abandoned.

Eau Claire County: The 1918 Federal construction in this county was considered in connection with the Chippewa County project and need not be repeated.

Florence County: The project in this county is located on the Armstrong Creek-Fence Road and is a joint project with Forest County. It consists of grading of six and one quarter miles and covering it with whatever material may be found within the right of way. The total joint Federal funds available on this project are \$22,012.32.

Bids were opened on this job in the month of June but were not satisfactory, and arrangements were completed with the commissioner of Forest County to proceed with this work by day labor. It is hoped that about one-third to one-half of this work will be completed during 1918.

Fond du Lac County: The first Federal Project in Fond du Lac County consists of concreting 3.7 miles of the Fond du Lac-Oshkosh

Road. This is undoubtedly one of the most important roads in the state.

Plans were completed and approved by the Federal Government in April, but bids were not received until a later date owing to delay in getting the approval of the Federal Government on account of the mail route situation. The job was finally advertised early in July but the bid was nearly \$10,000 over the \$75,000 available, and the county did not feel like meeting the deficit at that time. The work is therefore abandoned until arrangements are made to finance it.

Grant County: The first project in this county consists of grading the Ellenboro Hill located on the Lancaster-Platteville Road, and includes a considerable relocation at the foot of the hill with a new bridge and concrete overflow section across the valley. Bids were received on this in July but were not satisfactory and it has been temporarily abandoned.

Green County: There was planned originally a Federal improvement for Green County for 1918, but difficulties were encountered which called for the abandonment of the project for this season. It consisted of relocating a section of the Monroe-Monticello Road on Trunk Highway No. 42. This project will be built in 1919.

Green Lake County: It was planned to spend the sum of \$15,000 in the improvement of the Green Lake-Berlin Road, but after making surveys it was found that this was a totally insufficient sum to properly improve this highway. It was therefore abandoned until it could be properly financed.

Iowa County: The sum of \$24,000.00 was set aside by the Commission for the improvement of the road between Ridgeway and Dodgeville. This consisted largely of relocating the present highway in order to avoid the numerous railway crossings on this trunk line.

Plans were completed and bids opened in July but they were not satisfactory. The principal reason for the abandonment was that the railway company had not consented to pay its share of the cost. It is hoped to build this very important work in 1919.

Jackson County: The sum of \$45,000 was set aside by the Commission to improve by concreting about two and one-half miles of road from Black River Falls toward Melrose. After the plans were completed bids were opened in July and after some delay a contract was finally let to Mr. James McDonald of Black River Falls for the sum of \$47,000. This did not require the meeting of any deficit by the county as there was \$2,000 available in the Town of Albion for the bridge. Work will be done in 1919.

Jefferson County: The Highway Commission set aside \$12,000 for the improvement of one piece of road in Jefferson County, and \$15,000 for another, located on two parts of the Watertown-Plank

Road. One piece is a joint proposition with Dodge County as noted under the Dodge County statement. However, the county board did not raise the county's one-third of either of these funds and the projects were necessarily postponed until 1919.

Juneau County: The Commission set aside the sum of \$30,000 for the improvement of the Kilbourn-Mauston Road, which was one of the worst pieces of road on the state trunk system. The improvement consists of about 12 miles of grading, of which about 5 miles will be surfaced with clay or shale. The plans were completed in the middle of the summer and bids opened immediately, but no satisfactory bids were received. Arrangements were completed with the county committee and commissioner to do the work by day labor. This work is proceeding in a very satisfactory manner and will be at least 50 per cent completed this year.

Kenosha County: The first project in Kenosha County consisted of concreting $1\frac{1}{2}$ miles on the Sheridan Road completing it from Kenosha to the State line. The joint funds available for this project amounted to \$28,296.12. The contract was let to Mr. John Darrow of Waukegan, Illinois, and the work was completed in 1918.

The second Federal improvement for 1918 in Kenosha County consisted of concreting $1\frac{1}{2}$ miles on the Sheridan Road, completing it from Kenosha to the north county line. The funds available on this work were \$27,875.94. This project was built by Mr. John Griffiths of Racine, Wisconsin, for \$25,556.00, and was completed in 1918.

These two pieces of road complete the paving with concrete of the Sheridan Road entirely through Kenosha County.

Kewaunee County: This project consists of gravel macadam $1\frac{1}{2}$ miles long from the west county line easterly on the Green Bay-Kewaunee Road. Bids were opened in July and the concrete work let to Mr. Fred Wolf for \$3,047.00. Arrangements were completed at the same time to have the county commissioner do the grading and surfacing with the remainder of the \$9,000 available. It is expected that this work will be completed during the present season.

La Crosse County: The first Federal Project planned for this county was a tar macadam road a little over three miles in length from the east county line westerly on the La Crosse-Sparta Road. Plans were completed and bids received in July but since these were unsatisfactory and the county was not in a position to go ahead with the surfacing work at that time, only the grading was completed in 1918. The surface will be placed in 1919.

The second project was planned on what is known as the Hunter Bridge road from the Hunter Bridge south, but owing to unfavorable conditions nothing but a part of the grading was done during 1918.

La Fayette County: The Highway Commission set aside \$18,000 for the improvement of part of Trunk Line No. 62. It consisted

of grading about six miles of road between Darlington and what is known as Hicks Corners on Trunk Line 20. After the survey and plans were made it was found that the funds provided were insufficient and the job was abandoned until it could be properly financed.

Langlade County: The Commission set aside the sum of \$39,000 for the grading and graveling of about 6 miles of the Antigo-Rhinelander road running north from the city of Antigo. After unsuccessful efforts to let it by contract arrangements were finally made with the county committee and commissioner to do the work by day labor. Work is proceeding in a satisfactory manner and it will probably be at least half completed during the present season.

Lincoln County: The sum of \$30,000 was set aside for the grading and graveling of about 4 miles of the Merrill-Tomahawk Road just north of the city of Merrill. Bids were opened on this in the month of June and the grading and culvert work let to Mr. George Langley for the sum of \$10,560. At the same time arrangements were completed to have the surfacing done by the county under the supervision of the county highway commissioner after the contractor had completed his work. The contractor will probably complete the grading during the present season, and the graveling will be done in 1919.

Manitowoc County: The first project in Manitowoc County has probably given the Commission more trouble than any other project started. It consists of the concreting of about 0.6 of a mile of road on the Lake Shore Road just north of the city of Manitowoc. The total joint funds available for this job are \$23,465.00.

After the plans were completed and final arrangements made with the electric company, whose tracks must be moved, the work was let in September to Manger & McGucken Construction Company of Milwaukee in the sum of \$31,265.00, the deficit to be paid by Manitowoc County. The Commission was notified, however, by the United States Highways Council that this work could not proceed and the work was, therefore, abandoned until 1919.

Marathon County: The Highway Commission set aside the sum of \$45,000 for grading and covering the disintegrated granite about 8 miles of the Stevens Point-Wausau Road running from the south county line northerly. Plans were completed and bids called for in July. No satisfactory bids were received, and the county not being in position to do the work at that time, the job was abandoned until 1919.

Marinette County: The first Federal Project in this county consisted of a joint project with Oconto County, and consisted of grading and graveling six and one-half miles of the Peshtigo-Oconto Road located on the west side of Marinette County and the east side of Oconto County. There was set aside the sum of \$24,000 from the Marinette County funds, and \$9,000 from the Oconto County funds.

After the plans were completed no satisfactory bids were obtained and arrangements were completed to have the work done in each county by the county forces. The work in both counties is proceeding in a satisfactory manner and both sections will be substantially completed during the present season with the possible exception of part of the surfacing.

Marquette County: The Commission set aside the sum of \$18,000 for the grading and top soiling of about four miles of the Endeavor-Packwaukee Road, commencing in the village of Endeavor and extending north. Owing to unsatisfactory conditions across a marsh no contractors bid on this work and arrangements were made to have the work done by day labor under the supervision of the county highway commissioner. This work will be substantially completed during the present season.

Milwaukee County: Two projects were planned for this county during the season of 1918. The first one was the concreting of two and one-fourth miles of the Loomis Road from the present concrete to the county line. Bids were opened in July and the work let to Mr. Geo. Czerwinski in the sum of \$58,440.00. This work was completed.

The second project in Milwaukee County consisted of concreting three quarters of a mile in the city of South Milwaukee on the Sheridan Road, being the only unimproved section of this road in Milwaukee County. The contract was let to the Dean Construction Company for the sum of \$21,189.00 and was completed in 1918.

Monroe County: The Commission set aside \$45,000 for the grading of about 11 miles of the Sparta-Mauston Road, including the notorious Meyers Hill and the Edminster Hill. This work was let to the Nelson-Webber Construction Company of Oconomowoc in the sum of \$49,881.00. The deficit on this job will be paid by Monroe County. This job will only be partly completed in 1918, but when completed it will be very much appreciated by the travelers over these two hills.

Oconto County: Two projects were planned for this county during 1918, one of which has already been noted in the discussion under Marinette County.

The Commission set aside \$15,000 for grading and graveling of three miles of the Green-Bay-Oconto Road from the south county line north. Plans for this work were completed at an early date and let to H. Lucia & Company for \$15,718.00. It is expected that this work will be completed during the present season.

Oneida County: Originally the Commission set aside \$7,500 for the first improvement of this county, but by later arrangements this was somewhat increased and the present joint funds available are \$8,455.00 for the grading of two miles on the Rhinelander-Enterprise Road. After two unsuccessful attempts to let this job by contract, the work was started by day labor under the supervision of

the county highway commissioner and will probably be completed during the present season.

Ozaukee County: The Commission set aside \$18,000 for macadamizing about two miles of the Port Washington-Saukville road. Efforts were made to let this in July but the bids were entirely too high and the job was abandoned until a more favorable time.

Pepin County: The first project in this county consists of grading and covering with gravel or shale about two miles on the Alma-Durand road, for which the Commission set aside the sum of \$9,000. This job was not advertised owing to the inability to let contracts in surrounding counties, and was abandoned until a more favorable time.

Polk County: The Commission set aside \$30,000 for the grading of about 13 miles of the Barron-St. Croix Falls Road. Plans were completed and the job advertised early in July. However, the bids received were not considered satisfactory and were rejected. Arrangements were entered into whereby the county forces were to do the work under the supervision of the county highway commissioner. However, but only a small part of the work will be completed during the present year.

Portage County: The Commission set aside the sum of \$24,000 for grading and covering with disintegrated granite about six miles of the Stevens Point-Wausau Road, running from the north county line southerly. Plans were completed and bids called for in July, but no satisfactory proposals were received. Work was therefore abandoned until a later date as the county forces were unable to undertake it at that time.

Price County: The first project in this county consisted of grading about seven miles of the Prentice-Phillips Road. Plans were completed at an early date and the job advertised but all bids were rejected, and the job abandoned until 1919.

Racine County: The first job undertaken in this county, and the first one in the state, known as Federal Project No. 1, consisted of concreting 3.2 miles on the Sheridan Road from the north county line to the existing concrete. The contract for this work was let to the Birdsell Construction Company for \$56,921.00, whereas the joint federal funds available were only \$53,317.00. The deficit in this case, as in all others, is met by the county. This job was completed, and with the completion of the South Milwaukee job in Milwaukee County, completes the concrete paving of the road between Milwaukee and Racine.

The second project planned in this county, the sum of \$24,000 being set aside by the Commission, consisted of concreting about one mile of the Sheridan Road from the south county line north. It consisted largely of a relocation by which two grade crossings were to be abandoned. Arrangements could not be completed with the

railway company for the payment of its share of the cost and the job was therefore abandoned until 1919.

The inability to complete this job was very disappointing to the Commission, as it would have completed the paving with concrete of the Sheridan Road from Milwaukee to the state line.

Richland County: The Commission set aside \$24,000 for the federal improvement in this county, but for various reasons it was not advisable to undertake the work during the season of 1918.

Rock County: The Commission set aside \$72,000 for the improvement of part of the Beloit-Janesville road. It consisted of concreting about three and one-half miles including about one mile in the City of Beloit. Plans were completed and bids asked for on the part north of the city limits but the bids received were unsatisfactory and the job was abandoned until a later date. When completed it is hoped this road will consist of an 18 foot concrete road the whole distance from Janesville to Beloit.

Rusk County: The Commission originally set aside the sum of \$15,000 for a project in this county, but for various reasons it was abandoned until a later date.

St. Croix County: The sum of \$18,000 was set aside for the grading of about eight miles of the Hudson-Menomonie road. Plans were partly completed but owing to the inability to get bids in this section of the state on account of the scarcity of men and teams, the project was halted and abandoned until a more favorable time.

Shawano County: The Commission set aside the sum of \$36,000 for the grading and graveling of about seven miles of the Green Bay-Shawano road from the east county line west. Plans were completed in the spring and the job advertised early in July. The contract for the grading and concrete work was let to the Jorgenson Construction Company in the sum of \$19,453.00. The surfacing work on this job will be done by day labor under the supervision of the county highway commissioner. It is anticipated that this job will be about three-fourths completed during the present season.

Sheboygan County: The Commission set aside the sum of \$27,000 for improving with bituminous macadam about two and one-half miles of the Green Bay-Milwaukee road. The plans were completed and bids called for early in July, but no satisfactory proposals were received. Owing to the county forces not being able to undertake the work at that time the job was temporarily abandoned.

Taylor County: The Commission set aside the sum of \$18,000 for grading about seven miles of the Medford-Phillips road. Plans were completed but owing to no satisfactory bids being received in any of the neighboring counties the job was abandoned until a more opportune time.

Trempealeau County: The Commission set aside the sum of \$18,000 for grading about three miles of the Blair-Ettrick road. Plans were completed and bids called for, but the only bids received were in excess of the funds available and the county did not see fit to meet the deficit. The job was therefore abandoned until a more opportune time.

Vernon County: The sum of \$24,000 was set aside for the grading of about three miles of the Viroqua-Richland Center road, consisting largely of a relocation in the hills. After plans had been completed bids were called for in July but the bids were unsatisfactory and the work was abandoned until a later date.

Walworth County: The joint federal funds available for this project are \$33,745.00 for the concreting of nearly two miles of the Elkhorn-Lake Geneva road. Bids were twice received on this job, but in neither case were they satisfactory. The work was therefore postponed.

Washington County: The Commission originally set aside \$24,000 for Federal Project in this county, but the county board did not raise their one-third of the funds and the job was therefore abandoned until the financing could be arranged for.

Waukesha County: The Commission set aside the sum of \$30,000 for building a macadam road about three miles in length on the Watertown-Plank road. This was to be in conjunction with a county improvement on this road. Bids were called for twice on this project but in neither case were they satisfactory, and the project was abandoned.

Waupaca County: The Highway Commission set aside the sum of \$30,000 for grading and partly surfacing about 10 miles on the Appleton-Waupaca road. Plans were practically completed and bids called for in July but no bids were received. It was not deemed advisable to carry the advertisements further and the job was abandoned until 1919.

Waushara County: The sum of \$24,000 was set aside for grading and partly top soiling 10 miles of the Wautoma-Red Granite road. The plans were completed but it was found that the funds were not sufficient and the job was abandoned until it could be properly financed.

Winnebago County: The Commission originally set aside the sum of \$75,000 for concreting about three miles of the Fond du Lac-Oshkosh road. This was advertised in July and contract let to the C. T. Welsh Company of Minneapolis, Minn. The work is under way and the job will probably be about one-third completed during the present season.

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Wood County: The Commission set aside the sum of \$15,000, which was later raised with the consent of Wood County, for the grading of about 2.8 miles on the Grand Rapids-Plover road. Bids were called for on this job early in July but they were not satisfactory and since the county forces were not in a position to undertake the work at that time the project was abandoned until 1919.

Many of the projects abandoned in 1918 for the various reasons stated above will be let early in 1919, and the present expectation is that all of them with many new projects will be completed in time for use in late 1919 or at the latest early in 1920.

EXPERIMENTAL ROAD WORK OF THE COMMISSION

SAND-HAY-TAR ROAD

Under the new State Highway Law the Wisconsin Highway Commission found itself with the problem of looking after the maintenance of a very large mileage of almost pure sand roads. These roads were of such a nature that many of them were impassable in dry weather and often in wet weather owing to the sand becoming quick. In other words, these roads were in bad condition a considerable part of the summer season and part of the spring season.

In times past many of the local communities had placed a covering of clay or gravel on these roads where any was available. Still other communities had placed a covering of hay or straw on the traveled way, but this latter was always quite temporary as the hay or straw was soon ground to pieces or blown away.

The Commission's engineers conceived the idea of making a mat of hay and tar which would have some strength within itself and also be better able to withstand the elements.

With this end in view the State Highway Department constructed a few short experimental sections in the month of August, 1917. This was done near Rio, Wisconsin. After about six weeks' wear the condition of some of these sections was satisfactory enough to warrant the construction of a longer experiment. The Commission set aside a fund for this purpose and the larger experiment was carried on during the first week of October, 1917, on somewhat over a mile of the old Portage and Kilbourn Road. The experimental road was constructed with the cooperation of Columbia County road officials about as follows:

The road was first staked out and aligned. A furrow was then plowed on each side of the road in order to hold the work somewhat true to line. After the plowing was done two teams were hitched to a small road grader and after several trips a reasonably good trench was constructed.

The road had previously been divided into twelve sections, which were constructed as follows:

Section No. 1: This section is 1000 feet long and 16 feet wide. It is one of two sections which contains an appreciable grade, at one point there being about 200 feet of 8 per cent. This particular hill had been a bugaboo for tourists for many years.

This section was covered with a layer of marsh hay which was given a treatment of about one and one-half gallons of Tarvia B applied cold. A second layer of hay was then applied and slightly over a half gallon treatment given. The section on the steep hill was given a considerably heavier treatment of tar than the flatter sections. After the last application of tar, sand from the roadside was spread by shovels over the entire section to a depth of about 1 inch. The hay used on this section, as well as on each of the other sections, was spread so that a ton covered about 350 square yards.

Section No. 2: This section is 1000 feet long and 9 feet wide. After the trench was constructed a layer of hay was placed and given a treatment of about one and one-half gallons of tar. This layer of hay contained about one-half the hay that was applied on the section. One-half of the remaining amount of hay was then added and given a one-fourth gallon treatment of tar. The remainder of the hay was then added in a third layer and this was also given a one-fourth gallon treatment. The section was then covered with about 1 inch of sand from the roadside.

Section No. 3: This section is 200 feet long and 9 feet wide. It is short because of the fact that it was almost impossible to obtain rye straw as the farmers did not care to sell it. The straw was placed on this section in the same manner the hay had been placed on the previous section and in the same quantity as to volume but, of course, not as to weight, as a ton of straw went much farther than a ton of marsh hay. The entire section was given a 1 inch treatment of sand the same as the former sections.

Section No. 4: This section was 1000 feet long and 9 feet wide. The first layer of marsh hay was placed, and without having received any treatment of tar, was covered with about 1 inch of sand from the roadside. The remainder of the hay was then added and given a treatment of one-half gallon of tar. This was followed with about 1 inch of sand from the roadside.

The subgrade conditions of this section varied quite considerably as the center part of the section had a harder subsoil than most of the road. The two ends, however, were exceedingly soft sand. This section appeared to be somewhat easier to construct than the other tarred sections owing to the heavy oiler not making as great a rut in the subgrade, owing to the first layer being untreated and covered with sand before the oiler traveled it.

Section No. 5: This section is 500 feet long and 9 feet wide. The treatment consisted of two layers of hay, each of which was given a treatment of one-fourth gallon of tar. The second layer of hay on this section was put on extra heavy and caused considerable trouble by getting into the gears on the oiler. This section was also covered with about 1 inch of sand from the roadside.

Section No. 6: This section is 500 feet long and 9 feet wide. The entire amount of hay was put on in one treatment and given a three-fourths gallon treatment of tar, after which the section was covered with about the regular 1 inch of sand.

The above six sections were the only ones on which the tar and hay were used together. Considerable trouble was had at first in getting the tar properly applied owing to the fact that the weather was fairly cold. To overcome this a tank car was heated a little, after which the sprayers on the oiler worked very satisfactorily, giving an almost uniform coating of one-fourth gallon per square yard per trip.

Section No. 7: This section is 500 feet long and 9 feet wide. A layer of marsh hay was placed and covered with about 1 inch of local sand. A second layer of hay was put on and also covered with about 1 inch of local sand, after which the road was ready for traffic.

Section No. 8: This section is 150 feet long and 9 feet wide. The section is short for the same reason that No. 3 is short. A layer of rye straw was placed and covered with about 1 inch of sand. A second layer was then placed and treated in the same manner and the road thrown open to traffic.

Section No. 9: This section is 100 feet long and 9 feet wide. The entire amount of rye straw was placed in one layer on the section and covered with about 1 inch of sand.

Section No. 10: This section is 550 feet long and 9 feet wide. It was constructed in the same manner as No. 9, except that marsh hay was used in place of straw.

Section No. 11: This section is about 300 feet long and 10 feet wide.

Owing to the fact that a great many local people believed that tar alone would be beneficial this section consisted of about 1 gallon of tar placed directly upon the sand without the use of any hay or straw. No particular good was expected to result from this and it was constructed to show what not to do.

Section No. 12: This section consisted of two pieces each about 300 feet long. On these sections no trench was made and the hay was deposited on the sandy road as the local people had been doing for several years. These sections were not given any treatment of tar or of sand, and were turned over to the traffic just as the hay lay on the road.

These sections were all inspected at various times during the season of 1918. On inspection in the spring of 1918 the sections were found to be in the following condition:

Section No. 1 was found to be in very excellent shape, especially on the hill, although the traffic was only using one track and was not being distributed.

Section No. 2, as well as several others, were found to be very poorly drained and the water was standing in the road. This fact undoubtedly assisted in rutting these sections more than they would have been otherwise.

Section No. 3 had rutted some but had not cut through any place, and there was little evidence of the straw being chewed up and the section was reported in fair condition.

Section No. 4 was in very good condition where the subgrade was hard but in not quite as good condition at each end. The section was not in quite as good condition as hoped for.

Section No. 5, as well as No. 6, was in very excellent condition, although No. 5 did not show complete penetration owing to the larger amount of hay. There was practically no rutting or bunching on these two sections.

Section No. 7 was found to be in very good condition, with only a small amount of hay chewed up by traffic and practically no rutting.

Section No. 8 was fair, the straw showing signs of giving way.

Sections Nos. 9 and 10 were in fair condition and were evidently better than No. 12, on which the hay was almost entirely chewed up and disappearing.

Section No. 11 showed practically no benefit from the tar. There were many small balls of tar and sand in the road. These were not an impediment to traffic nor were they of any benefit.

Nothing was done to the road during the season of 1918 and the sections gradually changed in condition until at the last inspection in the fall (after 12 months service) they were about as follows:

Section No. 1 was mostly in fair condition, although in places traffic had dug holes through the hay. There was still an entire track on the hill which had not been used and which will suffice for traffic during 1919. This section with a small amount of repair work can be put in very good shape for another year's travel.

Sections Nos. 2 and 3 were in fair shape although cut up to a great extent and in need of repair work.

Section No. 4 was almost entirely destroyed, showing that the untreated first layer was not advantageous. This layer was found to be entirely rotted away but was not worn out.

Section No. 5 was not in the shape that it was expected to be, as it was badly bunched apparently owing to the excess amount of hay put on.

Section No. 6 was perhaps in the best condition of any of them, excepting just where the traffic went up the hill where it had bunched the hay somewhat. This section gave a very good footing for traffic during the entire year.

The hay and straw on the untreated sections had practically all disappeared so that they were of little value to traffic after a year's time.

The sections of untreated hay and straw that had no sand placed on them disappeared very early in the season.

The following observations have been made by the engineers of the Commission:

1. The untreated hay was destroyed largely because it rotted and not especially because it wore out.
2. The untreated hay with sand on it enabled the treated layer to be placed much more uniformly and without the formation of ruts, but the first layer of hay was of no especial lasting benefit to the road.
3. That the method of applying the tar was not satisfactory. The running of a heavy roller over the layer of hay formed large ruts in

the sand beneath, which could not be removed. Some better method should be devised if this type of road is to be constructed.

4. Owing to the draft of traffic the hills became bunched somewhat easier than the flats.

5. Where such a road was to be maintained the second and following years treatments could be much less in volume as to both hay and tar than was the original experiment.

6. The treated sections are several times the life of the untreated sections, just how much cannot be stated.

7. There was very little difference in the results with hay and straw. This was rather surprising as it was anticipated that the hay would be much more satisfactory than rye straw.

8. It was determined that the mere adding of sand to an untreated application of hay or straw greatly increased its life, and it was felt that this discovery alone was worth the price of the entire experiment, as many sections in the state have been merely placing hay on the road and by adding the sand they could easily double the life of the hay.

The cost of the experiment was \$7.00 for rye straw purchased at \$6.00 per ton; \$156.00 for marsh hay purchased at \$8.00 per ton delivered on the road. The cost of the teams was \$216.00; the cost of tar \$322.00, making a total of \$701.00 for the construction of 4,977 square yards, which were treated with tar to the extent of from one-half to somewhat over a gallon per square yard, and of 1,900 square yards which did not receive any tar treatment. The cost of the tar was then 6½ cents per gallon.

The Commission did not maintain the road in a first-class manner during 1918 because it felt that it was obtaining the information it desired. The engineers of the Commission are satisfied that this type of road can be built and give satisfaction to the traveling public. The cost, of course, will vary very largely as the cost of the tar varies, as it is the largest element entering into the cost. When built on a large scale, many of the items could be very materially reduced as the work could be better organized, and it is possible for a large crew to build a long section of road per day.

The Commission does not recommend this type of road excepting where it is impossible to obtain any local clay or gravel. At the present time in some places a mile of 9 ft. road treated in the best manner above described would cost about \$1,000 per mile. This might be justified where no other material could be obtained, but the Commission feels that this money could be more economically expended if used for the placing of clay or gravel if the same be available within a distance of several miles.

The Commission is satisfied that in extreme conditions this type of road can be economically built and maintained for light traffic, but would not recommend it for a road carrying any large amount of heavy truck or wagon traffic.

SURFACE TREATMENTS ON MACADAM ROADS

Owing to the considerable mileage of macadam roads in need of some form of surface treatment, the Commission decided in the summer of 1917 to carry on some experiments as to the best method to proceed with the surface treatment of these roads.

The road that was finally selected was a section of 9 foot waterbound macadam road between Baraboo and Kilbourn in Sauk County. This road was selected because of several reasons. In the first place it carried a very heavy motor traffic owing to the location of summer resorts on it. Although built in 1913-14 no maintenance whatever had previously been given the road in the way of surface treatment and the surface was in a very rough and uneven condition. In fact some sections should have been entirely rebuilt. Another reason for its selection was that part of the road was built of limestone and a part of quartzite.

In order to compare the various kinds of absorbents on both oil and tar treatments, the road was divided into sections, experiments being duplicated on limestone and quartzite. The selected section was about two and one-half miles long and was staked off into 400 ft. sections, each section being located with a post having the section number on it.

The weather conditions during almost the entire experiment were ideal, the weather being bright and warm. The work was done between August 15th, and August 22, 1917.

The following absorbents were used: For some sections that were rebuilt a one and one-half inch quartzite was used. This stone is of a quartzite formation but not from a quarry, being apparently a glacial drift.

For other rebuilt sections one and one-half inch limestone of a comparatively soft nature was used.

One-half inch to three-fourths inch crushed quartzite was used on some sections.

Five-eighths inch pea gravel shipped in from Winona, Minnesota, was used on other sections. This gravel was very uniform, very clean and largely of an igneous nature.

Torpedo sand of a very good quality and very clean was used on still other sections. This sand was shipped from commercial pits at Janesville, Wisconsin.

On other sections a very fine local sand of a very poor quality was used.

The bitumens that were used consisted of Trinidad Liquid Asphalt and Tarvia B.

There were four units of seven sections each. These units were: one, quartzite old surface with asphalt as the bitumen; two, quartzite old surface with tar as the bitumen; three, Limestone old surface with asphalt as the bitumen, and four, Limestone old surface with tar as the bitumen. The sections in each case were as follows:

1. The resurfacing of a piece of road with a new layer of about 2" of the large quartzite. This not only covered the 9' width of the

old road, but reached out about 1½ feet on each side thus widening the road to about 12 feet in width. These sections were thoroughly rolled and were given enough bitumen to complete the resurfacing in a satisfactory manner.

2. The same as No. 1 except that large limestone was used instead of the quartzite.

3. Treatment with ¾" pea gravel as an absorbent.

4. Small quartzite was used as an absorbent.

5. Torpedo sand was used as an absorbent.

6. Treatment with an absorbent of fine local sand.

7. Treatment with no absorbent.

All of the bitumen was placed with a power sprayer mounted on a 4-wheel drive truck. The mechanism was so arranged that the quantity of bitumen used was determined entirely by the speed at which the truck was driven. In other words, the amount through the nozzle was constant as the bitumen was forced through by a gasoline engine mounted on the rear of the truck. Therefore the speed of the truck determined the distance over which this constant amount would be spread.

The entire cost of this work was paid for by Sauk County whose committee and county highway commissioner gave the Commission every assistance possible in the carrying on of this experiment.

The sections were inspected from time to time but many of them were abandoned owing to the inability of the section to bear the traffic which this road carries. The road has been and is now being taken care of by Sauk County and naturally many of the sections have been abandoned and turned into a better type of treatment than the one given originally.

As a result of these experiments and the observations made on them the Commission's engineers have come to the following conclusions:

1. That a bituminous layer about 2" thick can be successfully placed on an old road with the cold penetration method, and this layer can be made wider than the old road, especially where there has been a certain amount of the original metal brushed off into the shoulders by the traffic.

2. Where an old macadam road is fairly rough, but uniformly so, not being full of large holes, the larger the absorbents used and the more angular it is, the better will be the surface carpet. In other words, the crushed quartzite and the five-eighths inch pea gravel gave better results than any of the other absorbents, especially on the rough quartzite road.

3. A fine sand of poor quality is little better than no absorbent at all, except that it prevents the bitumen from being picked up by the passing vehicles.

4. Where material is being shipped in for an absorbent, it is better to ship in material over one-fourth inch rather than under, as some additional metal will then be placed on the highway.

5. It was found that more care was required in the placing of resurfacing with asphalt than was required with the light tar by the

cold penetration method. This is true because where a slight excess of asphalt was used ruts developed, but where a considerable excess of tar was used it merely resulted in deeper penetration and no ruts were formed. This was found to be true, not only on these experiments but on the regular work carried on in various places in the state. However, good results were obtained with the asphalt in many places, but only where great care was used to get only the proper amount of asphalt. It was also found that the tar penetrated a little better and a satisfactory job could be obtained under more adverse conditions than could be obtained with asphalt.

6. It was found that a more satisfactory surface treatment was obtained where a very light treatment of tar was used on as the first application. This could then be successfully followed by more tar or by an asphalt treatment. It seemed that the tar penetrated much better and provided a better bond for later treatments.

7. It was found that it did not pay to treat macadam roads that were in very poor and rough condition. Such roads should be reconstructed by scarifying and adding a small amount of new metal before giving them a semi-penetration or surface treatment.

8. It was found that better results were obtained by leaving the bitumen uncovered for some time before applying the absorbent, especially where sand was used as an absorbent.

Anyone especially interested in this experiment can receive further details of the work and the results obtained, by writing to the State Highway Department, where all the information is on file.

REINFORCING OF CONCRETE ROADS

In the summer of 1917 it was decided to make some experiments on the reinforcement of concrete roads. A certain amount of reinforced work; in fact, several miles, had already been built, using American steel and wire of different weights. Because of this fact the mesh material of that company was left out of the experiment. Because of the fact that it is believed by the department that a majority, if not all, of the reinforcement should be laid transverse to the road, a large amount of the experiment was carried on with plain rods. The reason the Department believes this is that the longitudinal cracks only are considered detrimental, while the transverse cracks are nothing more or less than additional joints. With this end in view, the Department made arrangements with Milwaukee County to carry on this work under the supervision of its county highway commissioner. Plans were completed and an attempt made to get the material desired, but some slight changes were necessitated owing to the condition of the steel market. The county finally secured 48 pound rib metal; 31.7 pound Clinton wire cloth; $\frac{5}{8}$ " square rods; and $\frac{1}{2}$ " square rods. These were hauled out to the various roads on which the experiments were to be carried on, the portions used for the experiments being selected owing to their varying nature such as being in cuts and fills or in well drained or poorly drained sections of the county.

The accompanying table gives the details of the experiments.

TABLE Z.—CONCRETE ROAD EXPERIMENTS.

Showing location of experiments, reinforcing used, etc., etc.

Name of Road	Station to Station	Reinforcing		Where and How Placed		Spacing	Thickness of Reinforced Concrete		Date built 1917
		Kind	Length	Location	Length of Slab		Side	Center	
Cedarburg.....	265+60-261+70.....	Rib metal.....	12 feet.....	2 in. from top.....	About 400 feet.....	.....	5 inches	7 inches	8/6/17 to
"	257+52-253+22.....	"	12	"	"	.....	"	"	"
"	248+92-244+62.....	"	12	bottom	"	.....	"	"	8/17/17
"	241+55-239+62.....	"	12	"	"	.....	"	"	8/27/17
"	111+55-140+05.....	1 in. rods.....	12	"	50 ft. alternate secs.	24 inches	"	"	"
"	110+05-151+43.....	"	12	"	50	"	"	"	"
"	151+18-150+53.....	"	16	top.....	50	"	"	"	"
"	156+53-160+03.....	"	12	bottom	50	"	"	"	"
"	160+03-172+78.....	"	10	top.....	50	"	"	"	9/6/17
Janesville No. 4.....	62+42-60+00.....	Rib metal.....	12	"	"	.....	"	"	"
"	60+00-52+43.....	"	12	bottom	50	.....	"	"	9/19/17
"	52+83-47+42.....	"	10	top.....	50	.....	"	"	"
"	47+42-30+38.....	"	12	"	"	.....	"	"	"
"	5+40-0+00 (N. S.).....	1 in. rods.....	12	"	50 ft. sections.....	24	7	Uniform	10/9/17
"	37+65-32+25.....	"	10	"	"	24	7	"	10/13/17
"	32+05-28+43.....	"	10	"	"	24	6	8 inches	10/17/17
"	28+63-20+90.....	"	10	"	alternate secs.	24	6	"	10/20/17
"	20+80-13+40.....	"	12	"	50 ft. sections.....	33	6	"	11/5/17
"	13+3-5+00.....	Clinton wire	12	"	"	33	6	"	11/7/17
"	17+40-5+00.....	1 in. rods.....	12 feet.....	"	50	24	6	"	11/22/17
Ryan No. 1.....	21+00-13+73.....	Rib metal.....	12	bottom	One continuous sec..	.....	"	"	8/9/17
"	8+80-5+34.....	"	12	"	"	.....	5	7	8/21/17
Silver Spring No. 5.....	264+60-239+26.....	Clinton wire. 12	12	"	50 ft. alternate secs.	.....	6	8	8/11/17
"	"	"	"	"	"	.....	"	"	8/19/17
"	"	"	"	"	"	.....	"	"	8/18/17

NOTE: Concrete not reinforced is 8 inches thick at edge and 8 inches at center.

All non-reinforced sections were made according to the state standard, which is eight inches thick at the center and six inches at the sides. All reinforced slabs were marked on each corner with an arrow pointing to the center of the slab. All ten foot rods were placed one foot off center and staggered.

It is still somewhat early to pass upon the respective merits of these different methods of reinforcing, but the Department believes that something worth while will come of it. There seems to be a considerable larger proportion of cracks in 18-foot concrete than there is in 16-foot concrete, possibly enough to make it worth while to reinforce the 18-foot roads. It will be noted that the experiment is based somewhat upon the assumption that a reinforced concrete slab can be used one inch thinner in average depth than if a plain slab is used. In other words, the saving in concrete may go a long way toward paying for the reinforcing. This does not necessarily mean that the standard six or eight inch thicknesses should be reduced one inch, but possibly that reinforced work should be built of that thickness and the plain concrete increased one inch in thickness.

It will also be noted that most of the reinforcement is very heavy as compared to that commonly used, but the belief of the Department is that the reinforcement should be in larger units; furthermore, as elsewhere noted, that it should be placed principally transverse to the pavement.

With this amount of experimental work, it is reasonable to expect that some definite conclusions may be arrived at within a year or so as to how and when to reinforce concrete roads in our state, and under our climatic conditions.

The Milwaukee County road officials very kindly cooperated in this experiment and the cost of the work was included in the cost of the original construction of the several roads on which the experiments were made.

*UNDERLYING PRINCIPLES CONTROLLING THE LAYING OUT, MARKING AND MAINTAINING OF A STATE TRUNK HIGHWAY SYSTEM

A talk given by A. R. Hirst, State Highway Engineer of Wisconsin, before the joint meeting of the American Association of State Highway Officials and the Highway Industries Association, at Chicago, December 12, 1918.

This subject has been deemed worthy of discussion at this time because many states have laid out or are about to lay out state highway systems or state trunk highway systems.

One of the principal reasons why the American states have not yet secured a system of highways comparable to those in European countries is that until very recently the counties and states built highways without having in mind the building of any definite system, and the expenditures were scattered on so many roads of varying importance that the results have not been as apparent as the expenditures justified.

It is becoming increasingly evident that if our states are to have a completed system of modern highways within this generation, their expenditures must be largely concentrated upon definite and restricted systems of highways, and not spread indiscriminately on all roads, as in the past.

In order to make possible this concentration the state highway systems must be most carefully selected, for this policy of concentration will meet much opposition, which opposition will in many cases prevail unless the basic layout is honestly, logically and adequately made.

I have ventured to discuss the principles which should underlie the creation of a state trunk highway system, because Wisconsin has in the past two years established such a system, and our methods of doing it and the lessons we have learned in the doing of it will doubtless be of interest to the states which have, or will shortly have, similar problems.

*NOTE:—This paper was written by Mr. Hirst especially for presentation at a national road meeting. However, it gives so concisely and clearly the reasoning and methods used in the creation, laying out, marking and signing, construction and maintenance of the Wisconsin State Trunk Highway System that its insertion here is deemed of value and interest. Portions of it were written for national consumption but the general reasoning was applied in Wisconsin practice and a record is, therefore, of state value.

It is probably germane to state at the outset that the whole cost of establishing, marking, administering and maintaining the Wisconsin Trunk Highway System and the state's share of the cost of all federal aid construction on it, is made available by appropriating 75 per cent of the net proceeds of the motor vehicle license fees for these purposes. The remaining 25 per cent goes back to the counties for the maintenance of other main roads.

WHAT SHOULD A STATE SYSTEM COMPRISE?

The first questions which present themselves are: What is a state trunk highway system, and what percentage of the public highway mileage of a state should be comprised in an adequate system?

Our conception is that a state trunk highway system is a system of highways interconnecting every county seat in the state, also every city or village having a population of 1,000 or more; offering full access to the agricultural, scenic, manufacturing and resort interests located within the state; and connecting also with the principal highways of all surrounding states.

We believe that the state trunk highway system should include approximately 10 per cent of the total public highway mileage lying outside the limits of incorporated cities and villages. This percentage may be high for some of the more thickly populated states and it may be low for the sparsely settled ones.

The present Wisconsin state trunk highway system comprises 5,000 miles, or about six and one-half per cent of our total rural road mileage. This system, however, is not entirely adequate; we expect the legislature will add from 1,500 to 2,500 miles within the next few years, bringing it up to about 10 per cent. In the sparsely settled sections of Wisconsin the present system comprises 10 per cent of all road mileage, and in the fully settled and partly settled counties it comprises about 6 per cent. It passes through 71 out of 71 counties (100%); 728 out of 1,242 towns (58.6%); 120 out of 125 cities (96%); and 157 out of 253 incorporated villages (62%). The aggregate population of the cities, villages, and towns through which the system actually passes is 81 per cent of the total population of the state.

We are convinced that a state trunk highway system should be generous rather than niggardly. Objection may be made that the more miles there are on the system the longer it will take to construct it. We doubt the force of this objection. In practically every state the construction of a complete state trunk highway system with adequate modern types of pavement must wait upon bond issues. We believe it is much easier to pass a bond issue in the average county or in the average state to build an adequate system of highways, than to build one that is inadequate. It will usually be easier to bond a county for \$3,000,000 to build an adequate system accommodating the great majority of the people, than to bond it for \$1,000,000 to build a smaller system accommodating a minority. On a larger scale the same principle is true for states. Human nature is still human nature, and men

still largely vote for that which directly benefits them and against that which does not.

Summing up, therefore, we believe that the state system should consist of an adequate mileage accommodating, as far as through lines of inter-county communication are concerned, all the people in every section of the state. Usually it will require 10 per cent of the road mileage of a state to accomplish this result, but this figure is subject to increase or decrease, varying with the degree of development of the various states or sections of the same state.

SELECTING THE SYSTEM

We have already stated that any state system, to be successful, must be honestly and fairly selected. It follows, therefore, that the selection should be largely in the hands of disinterested engineers, subject, however, to review by a fair tribunal and made only upon the fullest knowledge of all roads which are proper candidates for positions upon the system.

In our state the selection was made jointly by the State Highway Commission and a Committee of five from the Legislature, appointed by the Governor. There was complete cooperation between the two bodies, and we believe that the result reached jointly was much more satisfactory to the people of the state than action by either body alone would have been.

Probably the best way to outline the methods which we believe should be used in selecting a system is to give briefly the methods we used in Wisconsin.

The first step in the layout was to select and place upon a map all roads in the state which, from the best available information, were the main lines of travel. These were studied very carefully and another map made showing a tentative system including the most desirable routes but not exceeding the maximum mileage allowed by the statute. These highways were strategically located so that parallel highways were placed a reasonable distance apart, and so that the areas untouched by any road were approximately equal in territory of equal development. As a result of this very careful preliminary work it was found that the tentative system coincided largely with the system finally selected.

After this had been done our division engineers made a careful reconnaissance survey of all the routes on the map, together with competing routes, where such existed, and such other routes as seemed to them to be worthy of consideration. This survey was made by automobile; the division engineer, who drove the car, acted as observer, and was assisted by a recorder who kept a record of all features of the road by tenths of miles on a prepared pad sheet. The features recorded included the character and condition of the road and its surface, culverts, bridges, drainage, soil, character of surrounding country, cheese factories, creameries, schoolhouses, farm houses, mail routes, railroad crossings, turns, hills, bad conditions generally, and

all other information of engineering and public interest. The actual mileage on the various routes was, of course, taken. By tabulating these sheets it was possible, in case of doubt between two competing routes, to get a very close idea of their comparative merit. It is unnecessary to go into further details of the methods used in this survey, especially since they have been described in various publications.

The cost of this automobile reconnaissance survey was about eighty cents per mile of road. The accurate knowledge it gave us of the physical conditions of each road was well worth the cost. Incidentally, in the later hearings we were often enabled to confound, with the extent of our precise information, local partisans who claimed not wisely but too well.

After all probable routes had been surveyed hearings were held at each county seat. At these hearings large scale maps showing the routes under consideration in the county and vicinity were displayed, and the advocates of all routes, especially the competing routes, were given a full opportunity to present their views. As evidence of the interest in the layout, most of these county hearings were attended by from three to six hundred people and much valuable information was obtained. The important result, however, was that the people knew that all possible routes had been investigated and that the advocates of all of them had been given a fair chance to be heard.

After a series of hearings covering a particular section of the state, the State Highway Commission and the Legislative State Trunk Highway Committee, which sat jointly with the Commission in many of these hearings, met at Madison and determined the official system for that section. Important considerations in arriving at the final layout were,—the population served, the grades, the supply of materials locally available for construction and maintenance along the various roads, and the transportation facilities available where local materials were not to be had. In many cases the choice between competing routes was determined by the character of the soil over which the two passed. Where one road was largely on good clay soil, for instance, and the other lay largely in sand, the clay route was usually selected because of its greater ease of maintenance, and because, naturally, it usually served better farming territory. Wherever two routes of equal general value were in competition, the one which served the most local purposes was the one selected.

It is interesting to note that in repeated instances routes entirely different from the ones formerly used were discovered and established with great advantage. Railroad grade crossings were avoided whenever possible and by changing established routes we were able to eliminate dozens of grade crossings from the routes of through travel without expending an extra dollar. Travel often gets accustomed to using a certain route and retains it long past the time of its superiority.

In laying out the 5,000 mile system in Wisconsin about 7,500 miles were surveyed. About five months were required by all the necessary operations and the total cost to the state was approximately \$20,000, or at the rate of \$4.00 per mile for each mile finally located on the sys-

tem, including the cost of the final survey (described hereafter) made in the spring of 1918.

The maintenance of this system was taken over by the counties under the general direction of the state on May 1, 1918, as required by law. As early as possible in the spring of 1918 a second survey of the lines as finally established, connected and numbered was made. This survey was for the two-fold purpose of recording the condition of the highways by tenths of miles at the minute state maintenance began, and for the second purpose of determining the location of the mile posts and patrol sections, the information to be placed upon the direction and danger signs, and their location, etc. This second survey was made in the same general manner as the first, but due to experience gained in the first survey, required less time, and though probably more information was taken the cost did not exceed sixty-five cents per mile.

We feel that a condition survey is necessary at the exact moment the maintenance of the system is begun, first, to obtain an accurate measurement of the system as finally laid out, and second, to make a record of the exact condition of the system so that improvements made can be later registered and compared with the original condition.

We have worked out a system of progress reports using colored crayon and tack entries on charts and maps so that the past and present condition of any section of the system and all structures on it can be determined at a glance. It is impossible to describe the details of this record system but we will later publish a full description after it has been fully developed.

A tabulation of this final condition survey (made as of May 1, 1918) shows that there were actually 4,999 miles of road on the system subject to state maintenance. Of this 167 miles (3.34%) were deep sand; 2,363 miles (47.29%) earth in good condition, 535 miles (10.70%) in poor condition; 1,001 miles (20.02%) of good gravel surfaces, 126 miles (2.52%) of poor; 573 miles (11.46%) of good macadam, 102 miles (2.03%) of poor; 120 miles (2.40%) of concrete; and 12 miles (0.24%) of other superior surfacings (brick, sheet asphalt, etc.).

Roughly summarizing, we took over 702 miles (14.0%) of sand and poor earth roads; 2,363 miles (47.3%) of good earth roads; 1,706 miles (34.1%) of various surfacings in good condition, and 228 miles (4.6%) of various surfacings in poor condition. A road or surface was classed as "good" when it was in condition to be maintained by ordinary patrol methods, as "poor" when it required extensive repairs or reconstruction before it could be so maintained.

We also took over 9,904 culverts, divided as follows: Concrete 4,140 (42%); Stone 1,050 (10%); Wood 1,164 (12%); Steel and Miscellaneous 3,550 (36%); and 1,951 bridges (water structures over six feet in span) divided as follows: Reinforced concrete 393 (20%); Stone 199 (10%); Wood 324 (17%); and Steel and Miscellaneous 1,035 (53%). Culverts, therefore, averaged two per mile of road and bridges 0.4 per mile of road.

There were on the system 617 grade crossings, 20 overhead crossings and 21 undergrade crossings with railroads and interurban railways.

It may safely be said that we took over some job!

MARKING THE SYSTEM

A state trunk highway system which is not completely constructed, (or even if it is completely constructed) is of no great value to the traveling public, unless it is so marked on the ground that the traveler may follow it without trouble. The marking and signing of a state system is a problem in itself and to this problem we have devoted a great deal of attention.

Our state trunk highway law provided that each state trunk highway should be given a number, which should be displayed along the road itself in a standard design, similar on all state trunk highways except the number. The state trunk highways are numbered in order of their length in miles from 10 upward, the longest (456 miles) being number 10. The idea in selecting 10 as the lowest number was that every highway number should contain two digits and thus give uniformity.

After considering a large number of designs for the standard marker it was decided to use a triangle containing at the top the words "State Trunk Highway," then the number in large figures, and in the lower point of the triangle the word "Wis." The triangle is 10" wide at the top and 13 inches long, and is placed on telephone poles on a white lead and oil paint background 18 inches wide; the triangle and lettering being coach black. We find that it is advisable to be rather profuse with these road markers. There should be one or two on each side of intersections with other roads and an occasional one between intersecting roads. The traveler welcomes their kindly reminder that he is still on the right road, especially at night, even when they are not absolutely essential for guidance. The white bands are just as valuable as the marker itself in outlining the route. Where a turn should be made the white band is widened to 30 inches and an "R" or an "L" stencilled beneath the marker in the white field. These markers were placed upon the telephone and telegraph poles, fences, culvert end walls and in some cases on boards nailed on trees, where other objects were not available.

By the cooperation of the seventy-one counties the whole system was marked in one week. Each county did the marking within its limits, the stencils and instructions being furnished by the State Highway Commission. As a matter of interest, one gallon of good thick white lead and oil paint covered about sixty average poles, two coats, bands 18 inches wide. The cost of marking in the counties varied with the care taken, the complexity of the roads, the length in the cities, etc.; the highest county rate per mile was \$5.25; the lowest \$1.00. The total cost of marking the 5,300 miles was about \$9,000, or at the rate of \$1.70 per mile.

The marking covers 5,300 miles, although only 5,000 miles are on the system and maintained. This is due to duplicate marking where

two trunk highways follow the same road for a distance, and to the fact that the marking continues through all cities although streets in fully built up districts of places larger than 2,500 are not a part of the system and are not state maintained. Careful and full marking through cities and villages is very essential and can hardly be overdone.

The system of numbering the highways has proven to be very satisfactory. The principal highways are now called by their numbers just as naturally as people call trains by number. For instance, if one asks in Madison the road to Wausau, he will be told "take State Trunk Highway No. 10," or if one is in Milwaukee and wishes to go to Fond du Lac, they will tell you just as naturally to "take No. 15," and so on.

We have erected county line signs and state line signs giving the name of the two counties and the county highway commissioner's name and address. On the same principle every patrol section has a sign at each end giving the name of the patrolman each way from that point. These two types of signs are placed so that the traveler may know who is responsible for the maintenance of the section of road over which he has just passed and of the section into which he is passing. We have found these signs very valuable in stimulating the natural spirit of competition and pride, which should exist in patrol work.

We have also set up standard mile posts or markers showing the state trunk highway standard design and number and the mile number measured from the east or south end of that especial state trunk highway. These mile posts serve to tie our office records to the road itself, and also enable any traveler encountering good or bad conditions to boost or complain to us, as the case may demand, and enables us to locate the exact place mentioned. Culverts and bridges are numbered and tied into the mile numbers,—thus the first culvert in mile number 25 on trunk highway 10 is 10-25-1, and the first bridge is 10-25-11, etc. All mile posts are of wood and cost us about \$1.50 each erected.

We are erecting about 2,000 direction signs. These are board signs painted white with black lettering. They are divided into "on system signs;" that is, signs at intersections directing both ways to places on that state trunk highway or beyond, and giving the mileage; and "off system signs;" located at intersections with other roads and directing to important points not on the state trunk highway system. These "off system signs" are located only at the intersection with the one road which should be taken from the state trunk highway to the point in question. A lecture could be given on the danger of indiscriminate signing, where several consecutive intersections give directions to a certain point when only one road should be used to get to that point. In brief, we believe that indiscriminately located direction signs do more harm than good.

We have also designed and have had made special metal danger signs for railroad grade crossings and dangerous hills and curves. These are the only metal signs we have used and cost us \$1.365 each f. o. b. Madison. Caution signs stencilled on telephone poles or other

convenient objects are used where there is no real danger if reasonable care is exercised.

Direction signs and all other signs are erected on wooden or concrete posts painted white. All posts and the mile markers should be erected as close to the traveled way as is possible without interfering with maintenance operations or being dangerous to travel. This is necessary in order to bring them within the area of motor vehicle lights at night, when the markers on telephone poles are sometimes hard to catch.

In addition to the above, all of which serve to outline the course of the system in one way or the other, we expect next year to paint or whitewash the end walls of all culverts, the end posts of all bridges, to place posts painted white at the end of all culverts without end walls, and where the fills are not high and we have no guard rails, we will outline the edge of the fills with stones painted white or with occasional white posts. This epidemic of white along the state trunk highways will be an additional distinctive marking and help travelers to follow the system, especially at night, besides serving the first essential purpose of indicating points of danger on the edge of the road. Some of our counties have this year done much of this kind of work and it has been found very effective for night travel.

Including the marking of the triangles (costing \$9,000) the total cost of marking, signing and protecting the state trunk highway system will be \$25,000, or at the rate of \$5.00 per mile. We believe that this expense, and much more, can be fully justified by the results attained. Our people are well satisfied with the system of marking and signing used, and we have received many compliments from travelers from other states who have passed through Wisconsin.

MAPS

The next thing after the system is laid out, surveyed, recorded and marked is the publication of a map, which will enable the traveling public to properly select their routes and the numbers. We are publishing a wall map (scale 1 inch equals 6 miles) showing all roads in the state, with the state trunk highway system, and the secondary roads outlined in red. This is large enough for general office use, and while the sale of such a map is limited, it is valuable for display in hotels, garages, clubs, etc.

The map for general public use in touring is published on a scale of 1 inch equals 16 miles. In addition to showing the numbered and marked state trunk highway system and the principal secondary roads, points of historic and scenic interest and state institutions are also located and numbered. Accompanying this map is a little booklet on Wisconsin giving her history, an index to historic, scenic, manufacturing and state property features located on the map, some record of its agricultural and manufacturing resources, and other material of interest. These maps are sold for ten cents each. After the first edition, the cost of which included about \$350 for the plates and set

up, succeeding editions cost addressed ready for mailing about 7 cents each, including 1 cent postage. About 20,000 were sold in 1918. We expect a larger circulation in future years.

It has been suggested that we issue sectional maps on a larger scale, but we do not believe that it is advisable. It takes a very large scale to enable one to follow a road map on the ground. With a good marking system a small map which enables one to select a route and get its number is as good as any.

The sale of the ordinary touring books giving routes by descriptive reading matter has been seriously curtailed in Wisconsin by the state numbering and marking system. These still have their field for interstate travel, but we believe should more carefully coincide with state routings, where established, than some of them do at the present. Many of the routes given in these books must have been established before the present dry era came in. Some of the route book publishers are correcting their publications to date and are following our state trunk highways wherever offered.

CONSTRUCTION

All Federal Aid construction is concentrated on the state trunk highway system. The legislature has also provided that at least one-half of the State Aid money, together with the county funds, should be expended on the state trunk highway system. In so far as possible these funds will be used to construct those places at present impossible to maintain in their present condition. We have no hope of reconstructing the entire system in an adequate manner for several years, but are using the limited funds available to get rid of the road terrors and thus strengthen the weak links in the transportation chain.

In our State Aid construction for the next year or two we are going to relax from our previous standards and convert construction funds into heavy maintenance work covering much more mileage. This will be true in both grading and surfacing work. Results secured by our gang maintenance this year fully justify this extreme departure from our previous practice if good patrol maintenance is immediately established.

We are insisting that no detours be made around construction except where traffic absolutely cannot be maintained. We do not believe that state or county organizations have been considerate enough of travel. Detours almost inevitably lengthen and confuse the route and almost inevitably are worse for the traffic than if it were allowed to go through. We insist that no more road be torn up at a time than is absolutely necessary and that the contractor keep his grading smoothed up and help travel through wherever travel can possibly be admitted. Wherever a detour has to be established we are thoroughly marking its points of departure from the trunk highway, outlining by paper detour signs similar to the state trunk highway marking its course around the construction, and placing the patrolman on the de-

tour to do as much as he can for the detour route during the period of construction.

We are having great trouble in getting contractors and foremen to be considerate enough to travel. They seem to think that the traveler is a common enemy instead of realizing that he is largely paying the bill, and that inconveniencing him unduly and arbitrarily may make an enemy to the good roads movement when we should all be seeking to make every man its friend.

MAINTAINING THE SYSTEM

We are now coming to the most important work in connection with a state trunk highway system. We do not believe that a state should lay out a state trunk highway system unless from the instant it is laid out it is maintained by the state at the expense of the state. The maintenance should be either under the direct control of the State Highway Department or, if under county control, subject to direct state supervision.

The fault with practically all so-called "trails" in America has been that they have been established with a great deal of gusto, barrels of paint were used in marking them, and then those interested have stepped aside and let the traveler encounter what he might, without any attention being paid to securing systematic maintenance of the roads which he is invited to use. The ordinary trail promoter has seemingly considered that plenty of wind and a few barrels of paint are all that is required to build and maintain a 2,000 mile trail. Inevitably with the establishment and marking of trails more travel is directed to the roads on them. If this increased travel is not immediately accompanied by adequate maintenance, the trail instead of being the best road through that neighborhood, which it may have been at the time of its establishment, will very shortly become the worst and should be avoided whenever possible.

In the same way, if a state lays out a state trunk highway system, it must at the same time provide for its adequate maintenance. The counties will not maintain it, the towns will not maintain it, neither will the cities nor the villages, because all of them reason that some day the federal government or the state, or both, are going to build it, or at least help to build it on very favorable terms, and why should they spend any money on it for either construction or maintenance. We hold it a truism that the establishment of a preferred system of roads by any unit of government should carry with it the immediate maintenance of that system by the establishing unit. It cannot be overemphasized that a state system of roads should not be laid out unless real state control of its maintenance is also provided. The state should pay for the maintenance, for state control without state money is bound to be difficult, not to say impossible, to administer. The same general principles would absolutely apply to any federal system which might be laid out.

There is much to be said for the Wisconsin system, in which the state has general supervision, the county organizations carry out the details of the maintenance work in accordance with state requirements, and the state repays the cost to the counties when the work is properly done. A one year's trial of this method has worked out quite well in Wisconsin. We cannot say that it has or has not worked out as well as would a system of exclusive state control. Under the plan of organization, long established for State Aid construction, county maintenance directed by the state seemed to be the logical method, and we will say that almost without exception the county organizations have cooperated wonderfully well and have gotten excellent results. Where they have not our law gives the state department adequate remedies.

We believe in the patrol maintenance system. Patrol sections of proper length, whatever the character of the highway, should be placed in charge of a patrolman who is solely responsible to those above him for the condition of his section. We have established about 480 patrol sections on our 5,000 miles of highway, varying in length from as little as 6 miles on very bad earth road stretches, to as much as 20 miles on some of the macadam truck patrol sections.

We believe that the average patrol section should be not more than 7 miles if the road is an earth road in average condition. Sections may be longer or shorter than this according to the character and condition of the road.

Patrolmen in Wisconsin were secured through advertisements in local papers after the patrol sections were determined. Applicants were asked to appear at the county seat and were looked over and questioned by county authorities and a representative of the state highway department. Starting salaries were fixed at from \$120.00 to \$135.00 per month and the patrolman is required to furnish a good team and a wagon. The county furnishes the remainder of the tools, consisting usually of a small four wheeled road grader for two horses; a road planer or road drag, or both; plow, shovels, picks, brush hooks, etc. Patrolmen are required to sign a contract and to give a bond for \$500.00. No very great difficulty was encountered in securing patrolmen except in certain localities where a large amount of war work was being done.

After the selection of the patrolmen county road schools were held at each county seat at which the division engineer and the county highway commissioner explained in detail the methods to be used in patrol maintenance. A pamphlet on patrol maintenance was also published by the Commission giving instruction for the gang and patrol maintenance of the various types of road.

Of the 560 patrolmen originally hired 75 were discharged and replaced before the end of the season. It was necessary in many cases to raise the compensation so that at the end of the season the scale was from \$120.00 to \$140.00 per month. Next year, unless conditions change, we expect to pay more, especially for the better patrolmen. The patrolmen are engaged continuously during the maintenance sea-

son, which with us lasts about eight months. In the winter season we expect to use them a part of the time for winter hauling of surfacing materials and for snow removal, where the counties are forced to remove snow owing to the failure of local units to do so. The patrolman's wagon is marked with the standard triangle and number and he is required to wear a distinguishing badge, to display a flag when off the road during working hours and to make daily and semi-monthly reports.

In general the patrolmen have more than justified our expectations. At least 65 per cent of them have given excellent service. About 20 per cent are on the division line between good and poor, and about 15 per cent will not be with us next year. We have had a small percentage of sections which as a result of a combination of disasters have given us considerable worry. We believe that when a section threatens to become a continuous "hoodoo," the only thing to do is to take it in hand and devote the organization's time and money to it until it is brought up to standard.

In 1918 we will reduce the length of many of our patrol sections and thus increase the number of our patrolmen. This increase will probably be about 20 per cent and will cut the average length of our sections from 8.9 to 7.45 miles.

We are trying to make the patrolman's job an attractive one and are going to make a specialty of paying the better men more money than the poorer ones so that they will realize the good services are appreciated. We hope to develop an esprit de corps by providing certificates of merit, banners to be displayed on especially well maintained sections, and bonuses for consistently good work to the good patrolmen. We want to make the patrolman's job one well worth while, for upon him rests the success or failure of patrol maintenance.

We have had very few complaints that the patrolmen were loafing. There has been some of this inevitably, but between the county highway commissioner's getting around almost daily, our division engineer or division maintenance engineer's visiting each patrolmen about once a week, and reports from travelers and neighbors we have kept a pretty close check on their activities and believe that there has been comparatively little shirking.

In addition to the patrol maintenance we organized each county for a certain amount of gang maintenance. This includes heavy road machine grading; scarifying, shaping and placing light resurfacings on old gravel and macadam roads; also the surface treatments. Roughly the expenditures for maintenance has been divided, one-half for patrol maintenance, and one-half for gang maintenance. The expenditures in 1918 were at the rate of about \$250.00 per mile. The cost of patrol maintenance per mile on earth and gravel roads averaged \$125.00, the remainder being expended for gang maintenance or maintenance of the more expensive surfaces, such as macadam.

Wisconsin made an error in distributing the funds available for maintenance to the counties pro rata with the state trunk highway mileage lying in them. The distribution of maintenance funds should

be made by the state department on the basis of maintenance needs. Type of road and amount of travel, of course, determine the funds which should be used, not any fixed factor of road mileage, population or valuation, or even automobile ownership. Other states should not repeat our mistake.

MAINTENANCE EXPERIENCE

It may be interesting to summarize briefly some of the conclusions we have reached as a result of one year's state maintenance. These may not be final but they seem well founded on our experience so far.

We find that earth roads of light clay or loam are easy to maintain either by dragging and planing or with the road grader, providing we have a rain about every ten days. Continued dry spells are almost as troublesome as continuous wet spells, especially on light soils.

The two horse four wheeled blade grader is the most effective tool for earth road maintenance. The road planers are the second most effective, but must be built much stronger than usually shown or sold if they are to stand the pounding of constant use.

We are going to start an intensive campaign for applying sand or gravel light surfacing on earth roads which are sticky or slippery after rains. We have been astounded at the results from light (2" to 4") sand and gravel coatings on heavy clay soils if followed by patrol maintenance. This is probably the most valuable lesson we have gotten from this year's maintenance experience.

We have learned that well-maintained earth roads need very little crown. The flatter and wider an earth road the better if it has good drainage and is kept constantly smooth. The same is true for all other types.

On sand roads we find that marsh hay and straw are effective if covered with sand at the time of application and that sand much prolongs the life of these materials. Cedar bark and cedar shavings are the best temporary sand coverings. Our tar-hay experiment on sand was quite successful but this method of sand maintenance is entirely too expensive, costing at least \$700.00 per mille per year to maintain a good 16 ft. composition surface. We believe that the economical thing to do with sands is to cover them with good clay or gravel as rapidly as funds permit. Tar-hay, hay, straw, and weeds wear out rapidly and are far more expensive in the long run than a clay or gravel permanent treatment under even very disadvantageous and expensive hauling conditions.

The roughest roads on the state trunk highway system have been the waterbound macadam roads which have been surface treated in past years. It is probably theoretically possible to maintain a limestone macadam road with surface treatments, but with the instruments of maintenance in the way of manpower we have to use in these days, effective results are very difficult to obtain. The untreated water-bound macadam roads maintained with light coatings of sand, pea gravel or stone screenings, or even with a road machine have been

more satisfactory than have the treated macadams that were not properly maintained from their construction. We expect as rapidly as possible to scarify all of our worn macadam roads, widen them to 16 or 18 feet, and cover them with a coating of two or three inches of fine gravel.

We have about given up the waterbound stone macadam road as too expensive a proposition to maintain. Some of the penetration macadams bound with tar or asphalt have given much better service than expected and have shown themselves superior in maintenance possibilities to any waterbound structure we have built. This is another reversal of a former opinion.

We have found that the most satisfactory cheaply built roads to maintain are the gravel roads. We have scarified many miles of old gravel roads and at a cost of \$200.00 or less per mile have produced a surface very satisfactory and easy to maintain. The more experience we have with gravel the more convinced we are that it is the lowest cost surfaced road, both to build and maintain, and much superior to waterbound macadam. We believe that the particles of gravel in the top four inches of a gravel road should not be larger than one inch, and we would crush even finer if it were not so expensive to produce fine crushed gravels. Gravel roads give the best and smoothest service without surface treatments. If it is necessary to treat them to eliminate dust use very light oils and don't try to build up a protective coat.

We have found trucks and tractors not generally satisfactory for patrol maintenance. Trucks give too much opportunity for joy riding, are economical only when used for hauling, and then only when rapid loading and unloading facilities are available. Tractors give fair service but to make them economical the sections must be so long that a part of the road lies undragged for too many hours after it gets in condition for dragging. It is a fact that with both the trucks and tractors that if the patrolman starts as soon as a road is fit for dragging, on the long sections the road has become too dry before he completes the two round trips necessary. Furthermore, neither tractors nor trucks provide the ditch and shoulder maintenance that can be gotten with a team. We are going to distinctly discourage the use of both trucks and tractors in patrol maintenance except as supplements to team patrol, and stand by old Dobbin.

Summing up the maintenance results we can say that on the State Trunk Highway System in Wisconsin, despite the fact that our construction has been cut to less than half of the normal due to war conditions, the main roads in Wisconsin were never so good as they have been throughout this season. We estimate that in one year we have improved the average condition of the 5000 miles at least 50 per cent. Competent estimates are that in the one year the increased number of miles per hour which can be safely averaged by auto over the state trunk highways is 7 additional miles. This improvement and this increased mileage per hour means much.

It is not safe to make broad statements because conditions as to soils and availability of materials vary so much in various states. We nevertheless believe that any state can equal or surpass this record at an average cost of about \$250.00 per mile per year. If more money can be made available the first few years, so much the better. We have learned to have the greatest respect for the less expensive methods of maintenance and construction which we did not entertain heretofore. In fact 1918 has taught us all in Wisconsin more than we have learned in several preceding years of routine construction.

We feel distinctly confident that if one year has enabled us to produce the results which have been produced, a succession of years will give us a passable highway system at an expense within our means. Maintenance will bridge over the gap which there must be between our present practically unroaded condition and the ultimate system of adequate highways built to bear modern traffic, which all states are going to have as fast as these systems can be financed and built.

Probably the best commentary on the maintenance results of this year is the fact that at the November meetings of our county boards many of the counties adopted county trunk highway systems to be maintained in 1919 by the counties by the patrol system. It is probable that the total mileage on these county systems is half that on the state system, so that Wisconsin will have 7500 miles of patrolled highways in 1919.

A PLEA FOR STATE MAINTENANCE

The states which are doing nothing to maintain through routes until they are constructed are making a grave mistake. Much can be done with the most unpromising system of roads if moderate maintenance funds are expended efficiently under the patrol system. It must be conceded that earth roads and the light types of temporary surfacings fall upon certain occasions to give 100 per cent service every day in the year, but on a surprisingly large number of days they can be made practically as good as any road. While they are not the ultimate, the man who waits for the ultimate is apt to find it upon the other side of the Styx.

If any state expects to build a complete modern state trunk highway system within a year or two, it need not establish state patrol maintenance; if it cannot, we urge it to get into the real maintenance game and wrest the best results possible out of what it now has in the way of roads.

If an as yet unroaded state, with insufficient funds available for construction on a large scale, wishes to do the most for its roads and for its people, we are convinced that for a few years it can do it by expending its money largely in intelligent maintenance, good grading and temporary surfacings over the entire system, than by building a few miles of high class construction in isolated stretches. In the average state two million dollars a year will adequately maintain and

do much to improve a road system of seven thousand miles or more; it will build each year about eighty miles of modern road.

Eventually we must all build certain of our main highways of the highest type of construction. We must immediately construct in this manner certain stretches which cannot be maintained so that they may bear the traffic which does or should use them, but the great mass of roads, even the most important roads, in the average state must wait several years before they can be rebuilt adequately. Why not recognize the fact and devote less state funds to construction and more to maintenance, not only of the inadequate road structures already built, but of the common earth roads as yet untouched?

I know this is unorthodox, especially coming from a state highway engineer, but if it be treason, make the most of it. For the next few years, if we have our way, Wisconsin is going to devote herself largely to maintenance and temporary grading, draining and surfacing. When we do spend large funds for final construction in that period, it will be for adequate widths of concrete or brick or whatever type may surpass these in final economy and ease of maintenance. These roads which cannot be maintained unless surfaced and which we are financially unable to build of the final type, will be built largely of fine crushed gravel, surfaced at least sixteen feet wide. This, we are convinced, is the cheapest and most maintainable of all low class surfaced roads. These conclusions are not entirely original with us. To other Western states, especially Michigan, Minnesota, and Iowa, we owe many of the fundamental principles upon which we have built, possibly, a more adequate maintenance structure.

It will be noted that we have said little about construction, which was at the outset urged as the basic reason for the selection of a state system. This is a considered omission. Construction will take care of itself as fast as congress, the legislatures and the people can be persuaded to provide the money. In the meanwhile we urge all states to get a proper state system laid out, to concentrate as much as possible of their construction funds upon it, and to build adequately when they do build. Pending, however, the final complete construction, which will be delayed many years in nearly all states, the important things to do are to so maintain the system, and to so temporarily but adequately remedy the bad spots and the real impediments to travel upon it, that the whole system is safely and comfortably passable throughout its length from the day of its establishment.

Not the stoppage of construction, but good construction, reduced a little, if necessary, to provide for the immediate maintenance of the whole system is the burden of this effort.

MAINTAINING THE STATE TRUNK HIGHWAY SYSTEM

MAINTENANCE POLICY

In planning the maintenance of the State Trunk Highway System, the Commission decided at the outset to install a thorough system of patrol maintenance, supplemented in practically all counties by small gangs for reconstruction and heavy repair work, and the following specific policies were adopted:—

1. To divide the system lying in each county into patrol sections, averaging, as nearly as possible, eight miles in length.

2. To engage a patrolman for each section, who would devote all his time to the work for the entire maintenance season, which is about seven months in northern counties and eight months in southern counties.

3. That the patrolmen be paid a monthly salary ranging from \$125.00 to \$135.00 per month for the season of 1918. The patrolman to furnish a satisfactory team and wagon, the county furnishing a light grader, road planer, plow, slipscraper and other necessary tools.

4. To hold the patrolman responsible for the maintenance of his section, and if extra help was necessary to adequately maintain any particular section, it was to be furnished by the county, but the work done under the direct supervision of the patrolman. The basic idea was to place responsibility "on one man only, the Patrolman."

5. Reports must be made daily to the County Highway Commissioner showing the hours worked and their distribution and semi-monthly reports to the division engineer's office showing the cost and distribution of both labor and material used. These reports must be received by the county before the patrolman's salary is paid.

6. To organize small gangs in each county, equipped for the special work required, according to the type of road to be maintained; a gang for applying surface treatments; one for heavy blade grader work; one for scarifying and shaping up old gravel and macadam roads; one for resurfacing, etc.

7. To make a condition survey by miles of the entire trunk system as soon as possible in the spring of 1918, showing the exact type and condition of each tenth of a mile of road and of each bridge and culvert on May 1st, 1918, the date provided for assuming the maintenance of the system, so that changes in type or condition could be shown on a progress chart in the main office, as reported from time to time by the division engineers.

ORGANIZATION

Early in January, 1918, the Division Engineers met with the County State Road and Bridge Committees and the County Highway Commissioners in each county and divided the system into patrol sections. The sections varied from six to twenty miles in length. Sections longer than ten miles were to be maintained by the use of a motor truck or tractor. At the same time the County Committees advertised for applicants for the position of patrolman, giving the limits of each section and the salary to be paid. A future date was set for applicants to present themselves at the county seat for an interview with the County Committee, County Highway Commissioner, and the Division Engineer. The most promising applicant for each patrol section was selected and a contract entered into, the patrolman furnishing a satisfactory bond in the amount of \$500.00 for the faithful performance of his duties.

About April 1, 1918, the County Highway Commissioner and the Division Engineer went over the system and determined the gang maintenance work necessary in each patrol section. The county made provisions for the crew and equipment necessary.

CONDITION OF THE SYSTEM, MAY 1, 1918

A condition survey was made as early in 1918 as weather conditions permitted. The survey shows that at the time the maintenance was taken over by the Commission the 5000 miles were divided as follows:

	Miles Good	Miles Poor
Earth roads	2363	702
Gravel roads	1001	126
Macadam roads	573	102
Concrete roads	118	3
Other high type roads	12	
	<hr/> 4067	<hr/> 933

Roads placed in the "good class" were those that could be maintained in a satisfactory condition by ordinary patrol maintenance methods. Those in the "poor class" required heavy blade grader work, drainage, resurfacing or scarifying before the patrolman could maintain them in a satisfactory manner.

The survey showed 9904 culverts on the system, of which 1164 were wood; 1050 stone; 3550 steel; and 4140 concrete. It also showed 2568 bridges on the system, 324 of which were wood; 199 stone; 1035 steel; and 393 concrete.

RESULTS OBTAINED

Our object was to get as many miles of the poor converted into good during the season of 1918 as was possible, knowing full well that the patrolmen would gradually change the "good" to excellent, but could not change the "poor" to "good" without help.

Counties were urged to provide the necessary crews and equipment to improve the "poor" sections by gang maintenance. The majority of the county committees and commissioners responded nobly. A few, however, needed an object lesson and in those instances were induced to visit some nearby county where work similar to that recommended was being successfully done. In practically every such instance the committees, on their return, made provisions for improving one or more of the poor sections in the county. Once started, the improvement by heavy blade grader work, or scarifying, was so great compared with the cost, it was difficult to keep the counties from expending more funds than were available.

We find at the close of the maintenance season, December 1, 1918, that approximately the following improvement on the state system has been accomplished by gang maintenance.

Heavy blade grader work, 625 miles; scarifying and reshaping stone and gravel surfaces, 125 miles; resurfacing stone and gravel, 150 miles; placing a temporary surface of clay or gravel on sand, 100 miles; covering bad sandy sections with hay or straw, 25 miles; bituminous surface treatments, 250 miles; covering badly worn macadam roads with a light application of sand or loam, 25 miles.

The gang maintenance work this first season has resulted in changing at least 350 miles of the poor roads reported May 1, 1918, to good, leaving them in such condition that the patrolman can maintain them in the future by ordinary patrol maintenance methods. Our annual spring condition survey in May, 1919, will give us the actual figures on the changed mileage resulting from 1918 maintenance.

PATROL MAINTENANCE

The success or failure of the patrol maintenance system rests to a great degree upon the individual patrolman. If he is intelligent, conscientious, honest, a good worker, and follows rigidly the instructions given him, he will make a thorough success of his section.

If each County Highway Commissioner insists upon each and every patrolman giving value received, knows when a patrolman has done a day's or a week's work, visits them often enough to know that the work is done at the proper time and in the proper manner and is not afraid to fire one who is not making good, he will make a thorough success of the work in his county.

Back of the counties is the State Highway Commission which must see that all counties are maintaining their portion of the system in an adequate and economical manner, and according to the specifications and directions laid down by the Commission.

Representatives of the Commission must visit the several counties often enough to know whether or not the maintenance work is being performed properly and adequately. If a county becomes negligent or allows the patrolmen to become lax, the Commission must have backbone enough to step in and take charge of the maintenance work

under the provisions of subsection 4 of Section 1317 of the statutes, or the state system will not be a success.

We have had but one county this year that came close enough to the poor line to warrant notifying them that unless a change was noted at once, the maintenance of the trunk system would be taken over by the Commission. This action was taken September 1st, and it was noticeable that more maintenance work was done in that county during September than in any previous two months' time.

There is employed on the system a total of 560 patrolmen. Of this number 75 have quit or have been fired during the season. In nearly all cases the vacancies have been filled. We have given each patrolman a rating at the close of the season, based upon the improvement made in his section, rather than upon the actual condition of the section. We find that 134 patrolmen are in the excellent class; 219 in the good class; 146 in the fair class; and 62 in the poor class. This shows that those in the excellent and good class, or 63 per cent, are really making good, and these are the men we wish to employ again next season. Those in the fair class, or 26 per cent, have possibilities if coached properly. Those in the poor class, or 11 per cent, will not be employed another season. On the whole, we believe the patrolmen have done wonderfully well. Many of them have had no previous experience in road construction or maintenance, and we have found that invariably they wanted instructions and advice from the County Highway Commissioner and the Commission to even a greater degree than they were available.

The age of the patrolmen range from 19 to 72 years and neither the oldest one nor the youngest one is in the poor or fair class. The majority, however, are between 35 and 55 years. The majority, also, are farmers or retired farmers. We also have many retired merchants and professional men, as well as one or two preachers. We have at least one patrolman worth no less than \$50,000 and many that are rated at \$25,000 to \$30,000. In the majority of cases, this class are making good. They made a success of their own business and are now making a success of the public's business.

EXPENDITURES

The total state trunk highway maintenance funds allotted to the counties for the season ending December 31, 1918, was \$1,008,336.76. In addition to this amount many counties made further appropriations for the maintenance of the trunk system. These two funds amounted in all to about \$1,250,000.00.

The cost of the patrol maintenance of the state trunk system was approximately \$600,000.00 or \$120.00 per mile for the entire season. This amount covers the monthly salaries of the 560 patrolmen, the cost of extra labor on patrol work, and the supplies and repairs used by the patrolmen. The balance (\$650,000.00) covers the cost of the gang maintenance work, previously described, and the unexpended balances which remain to the credit of a few counties.

About 50 per cent of the counties have adopted a secondary or county trunk system and will engage patrolmen for the maintenance of this secondary system. Generous appropriations have been made for this purpose. It will be necessary for all counties inaugurating patrol maintenance on a secondary system, to employ experienced men to supervise the work of the patrolmen. It will be physically impossible for the County Highway Commissioner to properly supervise two sets of patrolmen and keep his office and construction work well in hand. The cost of such supervision can be properly charged to and prorated over the different maintenance funds, and will be returned to the county many fold in a better maintained systems of highways.

IDEAS SUCCESSFULLY PUT IN OPERATION AND LESSONS LEARNED IN 1918.

1. That a good earth road may be had for from \$100 to \$300 per mile by the use of a heavy blade grader and large tractor.
2. That width and smoothness of surface are of more importance than low grades.
3. That where a patrol maintenance system is in operation, no road should have more than a four to six inch crown for a 24-ft. shoulder to shoulder roadway.
4. That an application of 2 to 3 inches of sandy gravel, not larger than one inch in size, on the surface of a clay road will give excellent results. Small stock piles should be deposited along the road for the patrolman's use in strengthening the weak places. Ruts will occur, but persistent light grading or planing will surely result in an excellent and cheap temporary surface.
5. That many roads ordinarily called "sand roads" can be converted into very satisfactory roads by light grading, consisting of moving in the unused top six inches of soil to the center for a wearing surface and keeping the surface smooth with a grader or planer. The bad sand requires a mixture of clay if available. If not, a covering of cedar shavings, marsh hay, straw, fine brush or weeds.
6. That the patrol sections should not exceed eight miles in length for team patrol and the patrolman should live on and near the center of his section. It would be economy for counties to build a shack for each patrolman near the center of the section. The saving of time will repay the cost of the shack in two seasons.
7. That the best single tool for the patrolman's use in keeping the road surface smooth is the four wheeled, two horse road grader. Next is the road planer.
8. That a wavy, uneven gravel road can be scarified and then re-shaped with a grader at a cost of from \$50 to \$75 per mile, resulting in an excellent road. If new material is required it should be of a size passing a one inch ring.
9. That a 9 foot gravel or macadam road can be scarified and widened to a 16 foot width by covering the old surface and $3\frac{1}{2}$ feet of each shoulder with from 2 to 3 inches of fine gravel. By the persistent use of the light grader or planer, the surface can be compacted without the use of a roller.
10. That a 9 foot macadam road can be successfully widened to a

16 foot width by resurfacing with 2 to 3 inches of stone, extending the stone over 3½ feet of each shoulder and binding the new material with bitumen. If properly constructed, the 3 inch depth of stone on the shoulder will amply care for reasonably heavy traffic.

11. That a badly worn macadam surface can be maintained cheaper by the application of about 2 inches of sand and that this will result in a more satisfactory road to travel than if a surface treatment is applied. It must be gone over frequently with the road grader or planer.

12. That no road should receive a bituminous surface treatment except where the surface is smooth and clean and when bitumen is used it should be of a quality and of a sufficient quantity to penetrate the road surface thoroughly. Holes appearing in the surface should be patched immediately by the patrolman. It is a waste of funds to apply surface treatments and not use an absorbent of stone chips, pea gravel or torpedo sand. The surface treatment of roads taking care of heavy traffic, that have been previously treated, should be continued, providing they have been properly maintained.

FUTURE MAINTENANCE

From the results obtained in 1918 by heavy blade grader work, the Commission plans to improve every mile of road on the system by "heavy blade grader work", except possibly, the former State Aid work, within the next three years. Also to scarify practically all gravel roads not surface treated, as well as many miles of macadam, at least once a year. The best time for this work is early in the season. The benefits derived from having the entire system well-drained and graded to a safe width for travel (24 feet from shoulder to shoulder) can hardly be estimated. The factor of safety alone is worth the cost. The very worst sections were graded in 1918, the next worst will be taken care of in 1919, and this work will be continued each year until the whole system is completed.

Heavy clay roads that which we know cannot be covered with a high type of surfacing within the next two or three years will be covered with two or three inches of fine gravel, if available within a reasonable haul.

The Commission does not encourage the use of motor trucks for patrol maintenance. However, each county should own one or more two and one-half to three and one-half ton trucks for delivering material to the patrolmen where the maintenance material must be hauled a distance of two miles or more during the summer season. A team of good horses or mules can perform any and all work on a patrol section that can be done with a motor truck but in many instances not as fast. On the other hand, a team can do numerous kinds of work that cannot be done with the truck. A motor truck to be profitable to the owner must be constantly in use. This is not possible on patrol maintenance. The team or truck must stand by the roadside a large percentage of the time while the patrolman is doing hand work.

There are several counties where the type of road and existing conditions warrant the use of motor trucks for patrol work. In such

counties the Commission will insist upon the patrolman doing only such work with the truck as can be done economically. Teams must be used to do the *natural team work*. We doubt very much if there is one county in the state using motor trucks for either construction or maintenance work that knows the true unit cost of operating the trucks, which cost must allow for depreciation and upkeep, as well as cost of operation.

Counties having gravel available, even though at long hauls, should plan to haul at least a portion of the necessary maintenance material during the winter. The material will then be at hand for the patrolman to care for the "bad spots" as the frost is leaving in the spring.

The Commission will encourage shorter patrol sections and where it is impossible to shorten an earth road section, will insist upon the county furnishing the patrolman the necessary assistance to permit the smoothing of the entire section during the day on which the rain ceases, provided the surface has dried sufficiently.

In a few instances counties have retained a patrolman on a section for some time after the county officials and the public were convinced that he was not giving value received. We prefer rather to have no patrolman on a section than one who uses neither his hands nor his head. In the future, if a section continues to remain in poor condition due to the patrolman's lack of effort, the Commission will not allow the bill for the patrolman's salary.

As long as the high prices of horse feed continue, we believe in paying the patrolmen accordingly. The salary must be such that it will attract good men. Patrolmen having had a year's experience should be worth more than new men, provided their work was satisfactory.

The Commission will insist that all patrol sections are provided with a light grader and other necessary tools. No patrolman can make good without the proper equipment.

A system of prizes or bonuses is being worked out to be awarded to the patrolmen on sections properly maintained during the entire season. We believe such a scheme will result in better maintenance and be worth many times its cost.

The Commission is satisfied with the showing made in 1918, its first year of state trunk maintenance, but is not contented. We expect and will insist upon each county doing much better maintenance work during the season of 1919.

We realize that the maintenance of the trunk system is a big undertaking and that mistakes are made, certain sections are not always properly maintained, patrolmen are seen loafing or not getting on the job in time. Such conditions are bound to prevail in a limited degree. We ask the public to assist us in bringing about satisfactory conditions by "constructive criticism" and information. Remember that each and every patrolman is working for and being paid by you. It is therefore your duty to report a patrolman who is not doing his duty. We will also appreciate suggestions or advice on local problems that you are thoroughly familiar with. We are all working for the same cause and the way to insure a well-maintained highway system in every county is by thorough cooperation between all concerned, the county, the state and the general public.

THE ROLL OF HONOR

The great war has left no American activity untouched. Elsewhere, in this report, we state its effect on our public work, but there is also the personal aspect, its effect on the personnel of our staff, which deserves mention. At the beginning of the war, this was composed very largely of young men, engineers, of the best age for military service. The demand for men for ordinary military purposes was so great as to reach practically every family in the country; the demand for engineers, particularly Civil engineers, was even greater. The response of our men is shown by the following statement.

When the war began, the Highway Commission had fifty-seven regular employees. Twenty of these resigned their positions to enter the United States Service, either Army or Navy. Since that time, fifty-three new men have been employed, and twenty-seven of these have followed the first twenty. Six others have resigned to take up war work of a non-military nature, ship construction, the construction of munition plants, inspection of war material, and the like. We view this record with pride, not that credit is due us as an organization, but pride in the character of the men we have had with us. The Honor Roll follows:—

Anderson, A. C.	Casserly, C. B.	Koszarek, S. A.
Astell, L. K.	Collignon, Jas. C.	Larson, P. D.
Ayres, A. O.	Crocker, W. C.	Lovejoy, R. M.
Bartelt, W. C.	Davy, G. F.	Moehlman, W. F.
Bennett, J. G.	Eldred, G. E.	Neff, E. L.
Bergman, A. E.	Germond, G. I.	Nickell, G. H.
Berteling, C. N.	Gillespie, J. E.	Phillipps, Wendell
Bjerke, Jérôme	Grebel, L. C.	Pollock, Jos.
Blodgett, C. W.	Haselton, Wm. J.	Rockett, L. C.
Bodenstein, A. S.	Heckert, C. J.	Romig, H. M.
Bowers, O. L.	Holmes, C. A.	Smith, Robt. E.
Breuer, O. W.	Holmes, H. F.	Stephens, U.
Brown, C. M.	Isaacson, Carl	Stern, M. L.
Brue, H. N.	Isabella, N. M.	Wagner, W. E.
Camlin, W. J.	Jaquish, C. H.	Whitney, E. N.
Casey, T. B.	Kleinheinz, F. J.	

We hope to be able to find a place for all of these boys who wish to return to us, especially those who were with us before the declaration of war. Their war service entitles them to every possible consideration and, besides that, they will give the state better service as a result of their military training and experience.

RECOMMENDATIONS TO THE GOVERNOR AND LEGISLATURE

The State Trunk Highway Law enacted by the legislature in 1917, and the amendments to the State Aid Act and the State Aid Bonding Act, have in general been very satisfactory, and there seems to be very little reason for making any radical changes either in the State Trunk Highway Law or in the State Aid Law.

Under the title "The Federal Aid Highway Law" we have discussed in some detail the federal aid construction features, and have pointed out the difficulty in securing construction in certain cases. These difficulties are so severe that, unless the Federal Congress changes the provision of the Federal Act, it seems necessary to change the provisions of the State Trunk Highway Act, in so far as they relate to financing construction. If necessary, the matter will be taken up with the road committees of the two houses as soon as they are constituted.

There are various other matters on which legislation would seem to be very desirable. They are as follows:—

1. THE REGULATION OF TRAFFIC, WITH ESPECIAL REFERENCE TO THE REGULATION OF MOTOR TRUCKS

(a) The automobile is here in tremendous numbers, which will undoubtedly increase from year to year. Previous legislatures have well regulated their speed, fixed the license fees and formulated the "Rules of the Road," which in general seem quite satisfactory. Consequently there seems to be no great need of further legislation along these lines except in the matter of lights hereinafter considered. There is the occasional reckless driver, but his control is largely a matter of policing, and the power to police is in the hands of the county boards to be exercised if local conditions require it.

The destruction of road surfaces due to the use of automobiles has been largely discounted by the advance in construction and maintenance methods. The automobile was a distinct problem to the highway builder a few years ago, but this problem has been met and largely solved.

Hardly had the automobile problem been met when there arose a new problem; that of the motor trucks, whose destructiveness is far out of proportion to their numbers. Unless the state legislature does something to regulate the size, weight, and speed of these vehicles,

there is grave danger that much of the highway investment so far made will be lost. The motor truck as a means of transportation is, however, here to stay. Its use should be encouraged. On the other hand, the makers and users of trucks should meet the municipalities half way in fitting them to the highway structures which are now in existence. The state has very few road surfaces which will stand the constant pounding of heavy trucks at any season, and, outside of a few miles of concrete and other high-class roads, practically none of the road surfaces which have been built will withstand even a few heavy trucks at certain seasons.

These road surfaces, while deficient for heavy motor truck traffic, are quite efficient for other traffic. The problem before the legislature is whether or not it is proper to allow a few vehicles of unreasonable size and weight to destroy road surfaces which are giving reasonably satisfactory service to all other vehicles. It is conceded that the main roads of the state should be placed in condition to bear economical motor truck traffic as soon as possible. It is, however, not possible to do this in a day or a year, or even in several years. From time to time roads between certain points will be completely constructed of material which will permit the use of motor trucks of any reasonable size, but until this is brought about the destruction of the present surfaces by the use of a few extraordinary vehicles should not, in our opinion, be tolerated.

The motor truck manufacturers of this country should determine upon a maximum weight and capacity truck to be manufactured in, say the next decade, so that the American people and American road builders, in building roads for motor vehicles, may build them adequate for the expected loads. If the motor truck manufacturers are to be allowed to increase the capacity of their trucks at will, and the type of next year may be twice as destructive as the type of this year, and the type of five years later twice as destructive again, it is obviously impossible for American communities to build roads to meet such rapidly changing standards.

The Wisconsin Highway Commission believes firmly in the motor truck as a means of highway transportation. It must, however, conform to existing road conditions so that our present highways will not be lost because of a limited use by one super-destructive factor. The Commission believes that many of the main roads of Wisconsin must be built as rapidly as possible to bear heavy motor truck traffic because the motor truck is undoubtedly, within the next few years, going to be the method of transportation used by much of the short haul freight and express business.

The problem is one worthy of the best attention of the legislature. The law should be formulated so as not to be unduly restrictive of the use of motor trucks; at the same time it is necessary to protect our present investment in highways.

(b) Involved in the traffic problem is the problem of proper license fees. The legislature of 1917 fixed the license fees for motor trucks,

when used on rural highways, at \$15.00 for trucks having a load carrying capacity of less than 2100 pounds; at \$20.00 for those having a capacity between 2100 pounds and 5100 pounds, and \$25.00 for trucks with a load capacity of 5100 pounds or more. These fees are very low compared with the fees in some of the eastern states. They are not by any means commensurate with the damage done by the heavy trucks. The problem of a fair license fee is distinct and separate from that of regulation, and should be given the most careful attention. There were licensed, during the calendar year 1918, 9504 trucks in Wisconsin. Of these trucks, 2643 were certified to be used only within the incorporated limits of cities and villages, in which case they pay only the \$10.00 automobile license fee. Therefore 6861 auto trucks were licensed to use rural highways at fees varying from \$15.00 to \$25.00 a year. The Commission will be glad to offer its services and statistics to any legislative committee which may consider the matter of motor vehicle license fees.

(c) The use of tractors other than motor trucks is rapidly developing. In many cases these tractors are equipped with types of lugs which are very destructive to highways and bridges. It has been demonstrated that lugs can be devised which offer sufficient traction without damaging road surfaces, and it is therefore very advisable that the legislature restrain the use of destructive types of cleats or lugs on tractors using the public highways. It is not the intent of the Commission to advocate anything but reasonable restriction, but tractors are being sold in Wisconsin and are being operated over our highways by a few thoughtless owners which should not be allowed to be sold, and if sold, should not be allowed to be used on highways. There are so many tractors which give satisfactory service and so many types of lugs which produce little or no damage to road and bridge structures, that the freak types should not be allowed.

(d) The matter of lights on horse drawn vehicles has been repeatedly called to the attention of the legislature. For the protection, not so much of the motorist as of the users of horse drawn vehicles, a law should be enacted providing that every horse drawn vehicle, except hay wagons, must carry lamps showing white to the front and red to the rear when on public highways at night. Such lamps can be provided at a very reasonable cost and will add very much to the safety and comfort of all users of highways at night. Many distressing accidents have been caused through the lack of lights on horse drawn vehicles, and the matter should be remedied.

(e) The matter of motor vehicle lights has received little attention from past legislatures. It is true, however, that driving by night with an automobile, or any other vehicle, has become so dangerous, owing to the blinding glare of many of the headlights now used, as to deter many from night driving. If a night trip is made, the inconvenience, worry, and danger deprives the driver and his passengers of much of the pleasure of the trip.

There seems to be no effective remedy except legislation. The prob-

lem is to provide for motor vehicle headlights that will meet the following requirements.

(1) They must give adequate illumination so that they will define the road surface, the width available for traffic, and reveal objects and persons on the road as far in advance of the motor vehicle as is reasonably possible.

(2) They should give no harmful glare which will blind the driver passing in the opposite direction.

An effective law must, therefore, provide for a beam of light of high intensity properly controlled to prevent dangerous glare. The problem is, therefore, one for solution by illuminating engineers. The Illuminating Engineering Society of America has formulated tentative motor headlight standards, and methods of testing are available whereby the acceptability of the various types of lamps and lenses can be determined. The Society is giving the matter further study and from their success so far, most effective further results may be expected.

The Commission believes it would be unwise for the legislature to fix statutory limitations in this matter. The science of lighting is rapidly developing and the standards and effects possible today may be obsolete tomorrow. The best solution would seem to be to enact a law giving the Highway Commission the power to determine, from time to time, upon standards for motor vehicle headlights and providing that any person may, upon payment of a fee to cover the cost of the necessary tests, submit for approval any device for controlling the illumination from head lamps so that it will be in accordance with the standards determined upon. It should be provided that after a date, reasonably removed, no motor vehicle should be sold or used unless equipped with headlights or controlling devices approved for use by the Commission.

Other states, notably New York, have similar statutes and such legislation would seem to offer the most sensible, effective and flexible solution of the present intolerable conditions.

2. STATE TRUNK HIGHWAY MAINTENANCE FUNDS

The funds available for state trunk highway maintenance are now distributed to the several counties pro rata with the state trunk highway mileage lying in them. In 1918 about \$201 per mile was so distributed. This will probably be increased to \$225 a mile in 1919.

As a result of this method of distribution, we find that many of the earth road counties have amply sufficient funds to maintain their earth roads adequately, while the counties with large mileages of narrow stone and gravel macadam surfaces and heavy traffic must make large additional county appropriations if their roads are to be maintained as adequately for the travel upon them as the roads in the earth road counties are maintained for the travel upon them.

The Commission recommends to the legislature that this obvious inequality be rectified by providing for some system of distribution of the state maintenance funds, by which all counties will receive uni-

formly adequate and fair amounts. Probably the best distribution would be one based solely upon the maintenance requirements. If this method is adopted the total funds available should be distributed, annually, to the counties by the State Highway Commission on the basis of the actual funds required by each county to keep its portion of the system up to the general state standard. This problem is worthy of especial attention as undoubtedly some injustice to certain counties now exists. It has been remarked hundreds of times in 1918 that the state trunk highways in the earth road counties are in much better condition than those in the gravel and macadam counties. The remarks have been justified—and the reason is as above.

3. TOWN ROAD LAWS

The state had adopted for maintenance a state trunk highway system and most of the counties have adopted secondary county systems for county maintenance, generally known as "county trunk highways systems." Both of these classes of roads have been taken out of the hands of the towns as far as the responsibility and expense or the administration of their maintenance is concerned. These two systems reach practically every town and have taken out of the control of the town its most important roads, and those upon which it formerly spent the largest amount for maintenance. It is estimated that at least 7,500 miles of rural highways out of the total of 77,000 miles, approximately ten per cent, have thus been removed from town control.

Most of the towns are still divided into road districts, and the funds in these various road districts are expended only for the maintenance of roads lying within the several districts. Now that many of these districts are traversed by state or county trunk lines, a large share of the expenditures normally required for those districts is no longer necessary. In repeated instances road districts have funds which are either largely wasted in maintaining a few miles of unimportant road or not expended at all. It is believed that in 1919 at least \$2,500,000 will be expended by the counties and the state for the maintenance of trunk lines. This should offer considerable relief to every town, but up to the present minute we know of few, if any, towns which have recognized the new conditions and altered the town road organization to fit the new conditions.

The present condition is that many road districts have had their important roads taken off their hands. Other road districts, not traversed by trunk lines, are trying to maintain their roads with the same old funds and the same old methods. The road districts in which trunk highways lie are getting excellent roads and probably not spending their district road taxes. The road districts, without trunk highways, are finding it hard to maintain decent roads with the district funds, under present conditions.

The development of trunk lines and county and state maintenance would appear to the Commission to make it inevitable that the legis-

lature should enact a law making it obligatory for the towns to abandon entirely the road district system. Whatever road taxes are needed to maintain the highways and bridges, remaining under the control of the town should be levied upon the town as a whole and should be expended under the direction of the town board, not by districts, but where most needed for the good of the whole town. This proposition would seem to be so sound and so self-evident as to need no argument.

We recommend most urgently that the legislature enact such a law. The fact that the town is considered a unit would by no means prevent the town board from constituting the necessary number of road superintendents to properly supervise the expenditure of the town funds. The town tax should be collected in cash only and expended on necessary work in the various road sections of the town in accordance with the orders of the town board.

It cannot be doubted that conditions on the roads under town control have not improved in a manner commensurate with the improvement on roads which are under state and county management. The trouble is due to the prevalent town road system (especially the small road district system) and it should be remedied, both as a matter of fairness to the districts not having trunk lines and as a matter of effective economy in the expenditure of town road funds. The counties are rapidly adopting more and more roads for county patrol maintenance. A patrol system must be adopted also for the more important town roads if they are ever to adequately meet town needs.

4. FURTHER MILEAGE ON THE STATE TRUNK HIGHWAY SYSTEM

At the completion of the layout of the state trunk highway system, the State Highway Commission and the Special Legislative State Trunk Highway Committee found that it had been impossible to place upon the system a considerable mileage of important main traveled roads, due to the fact that the statutory limit of a 5,000 mile system had been reached. At that time and since, there has been, in a number of counties in the state, a demand for an increase of the permissible mileage on the state trunk highway system, so that these roads might be added to the system, be maintained by the state, and be eligible to construction under the Federal Aid Act.

The State Highway Commission decided, at a recent meeting, to make no recommendations in regard to increased mileage. There can be no doubt that there are several hundred miles of road in the state, which are of state importance and which could well be added to the system.

However, the sole means, at present, of financing the federal aid construction and the maintenance of the state trunk highway system is three-fourths of the net proceeds of automobile license fees. Due to the war and its consequences, these funds have not sizeably increased and probably will not materially increase for two or three more years. The inclusion of more mileage on the state trunk highway system means that the state will be responsible for more maintenance, and the

total sum for maintenance being the same, any sizeable increase in mileage will reduce the amount available per mile, so that the maintenance funds available may be insufficient to adequately maintain the enlarged system.

Furthermore, there is every indication that the federal funds available for construction will be materially increased within the next year or two. Under the present state trunk highway act, the funds to pay the state's share of federal aid construction are also provided from the automobile funds as above mentioned. If the construction funds necessary to be provided are materially increased, it therefore means that the funds available for maintenance are materially decreased.

There are many good reasons for completing the layout and for providing for the marking and maintenance of an entirely adequate state trunk highway system by adding more mileage. There is, however, as pointed out above, the grave possibility that any material addition to this mileage, unless the state further finances the construction and maintenance, will decrease the efficiency of the present system.

The State Highway Commission brings the matter to the attention of the legislature without recommendation, but with the caution that the problem of financing any additions must be carefully considered in view of the fact that the funds now provided will probably be hardly adequate to meet maintenance and construction obligations on the present system.

5. MATTERS OF LESSER IMPORTANCE

There are several less important and less urgent matters which could properly receive legislative attention, as follows:

(a) The removal of obnoxious and dangerous advertising signs and billboards, especially at corners.

(b) The clearing up of the situation in regard to the emergency reconstruction of bridges on county and state trunk highway systems.

(c) The imposition of adequate penalties for the malicious or thoughtless destruction or defacement of road signs, markers and danger signs.

(d) Snow removal by the counties on the more important lines of travel, especially those having a large truck and wagon traffic serving for producing and other industries.

(e) The utilization of convict labor, especially in preparing road materials at central points.

(f) The freeing of important bridges from tolls and more adequate provision for the early reconstruction of toll and other long bridges of inadequate width and strength.

(g) The securing of the widening of approaches to railroad grade crossings and better crossings with railroads. Many approaches and crossings are now objectionable and dangerous and some quick and effective method of procuring improved conditions should be devised.

CHART SHOWING INCREASE IN THE COST OF ROADS COMPARED WITH THE INCREASE IN PRICES RECEIVED FOR VARIOUS FARM PRODUCE.

This chart is published for what it may be worth to indicate the relative increase in the cost of roads and of other commodities from 1913 to 1918, inclusive. The average prices for 1913 are used as a basis (100%) and the average prices of subsequent years were ascertained and the percentage that these averages were of the 1913 averages were plotted. Average prices were derived by adding the 12 average monthly prices and dividing by 12. This gives curves showing the relative increases, each one of which is labeled for the commodity treated. Thus, corn in 1914 was worth 13% more than in 1913; in 1915, 18%; in 1916, 34% in 1917, 166% and in 1918, 168%, etc., etc.

Chicago board of trade prices were used for commodities handled by that body; hog prices from Swift & Company. Milk is the average of two Wisconsin condenseries. Wages from Wisconsin Industrial Commission, and road prices from the records of the Wisconsin Highway Commission. Every effort was made to get reliable figures. It should be remembered that the percentage of increase would probably be correct whether the local prices anywhere were higher or lower than at the basic points used.

From the base figures some interesting comparisons may be drawn. In Wisconsin in 1913, for instance, 100 pounds of hogs would pay for 5.6 sq. yds. of concrete road; in 1918, the same weight would buy 9.2 sq. yds.; an increase of 65%. In 1913, 100 pounds of milk would pay for 4.6 cu. yds. of grading. In 1918, they would pay for 6.9 cubic yards; an increase of 50%. In 1913 a bushel of wheat would pay for 1.9 sq. yds of stone macadam; in 1918, for 2.8 sq. yds., an increase of 47%. Similar instances could be multiplied, but the above will confirm what the table shows, viz.: That the cost of road work has not increased as has the price of Wisconsin farm produce during the period treated. In other words, we can buy roads much cheaper now (if we express cost in terms of produce, not dollars) than in 1913.

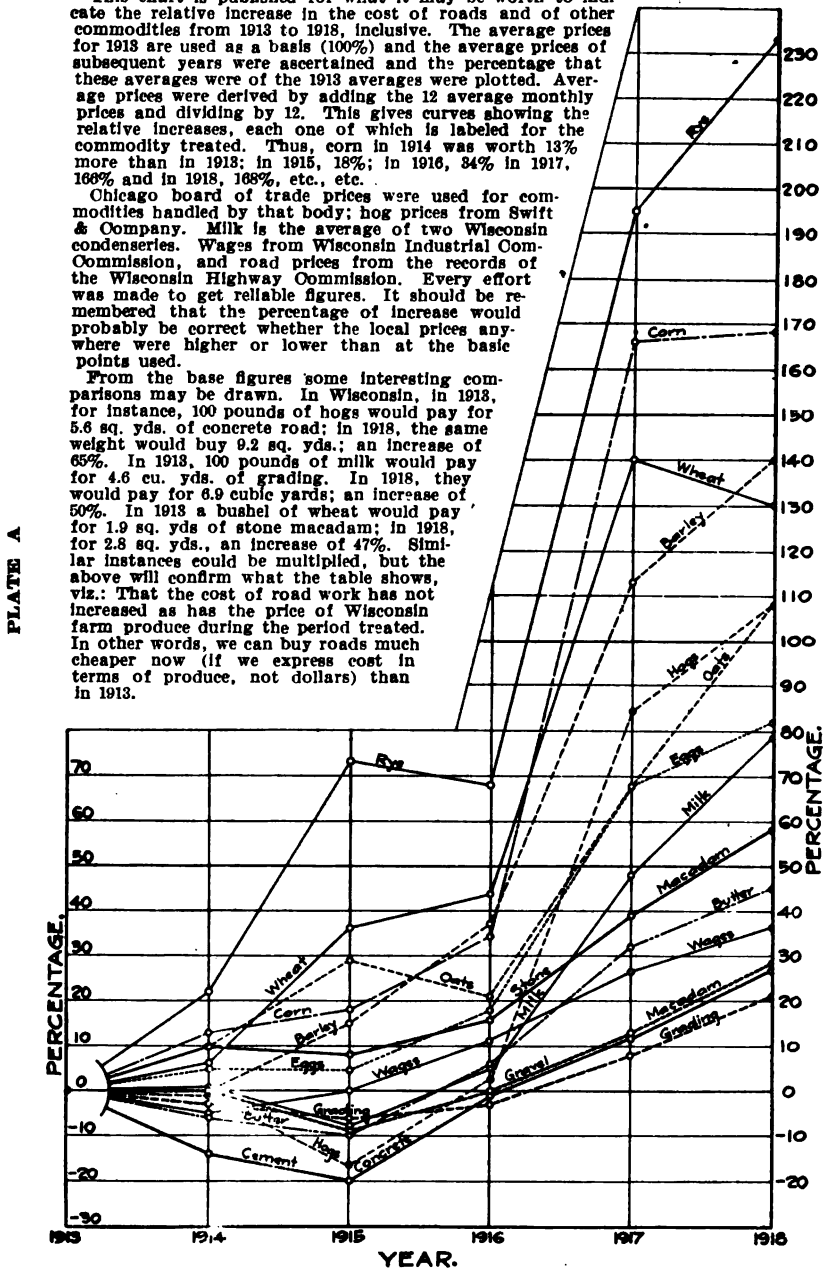
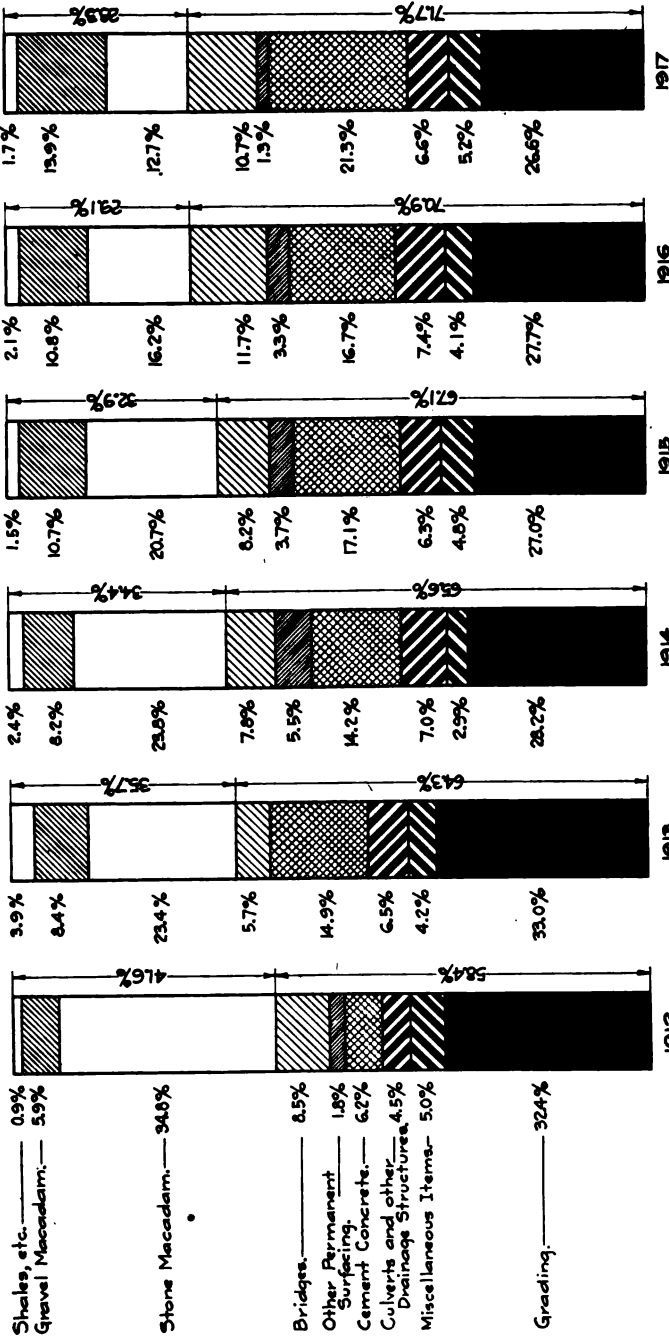


PLATE-B.



DISTRIBUTION OF STATE AID HIGHWAY EXPENDITURES.

Showing graphically the percentage of all expenditures under the State Aid Law going into each of the principal items of construction, each of the six years of operation. Note that each year at least 58.4 percent has gone into the items of Grading, Miscellaneous Items, Drainage Structures, Bridges, Concrete and other Permanent Surfacing (Brick, Asphalt, etc.), all permanent improvements in the strictest sense of the term.

WISCONSIN BIENNIAL REPORT - WISCONSIN HIGHWAY COMMISSION

PLATE C



FIG. 1. Standard Mile Marker.

Placed every mile. The mile number below the marker is the distance from the south or east end of the State Trunk Highway, and with the road number on the marker identifies each separate mile on the system.



FIG. 2. Standard Trunk Highway Marker.

Placed on telephone poles, buildings and elsewhere, to guide travel. Uniform, except the number, on all parts of the system.

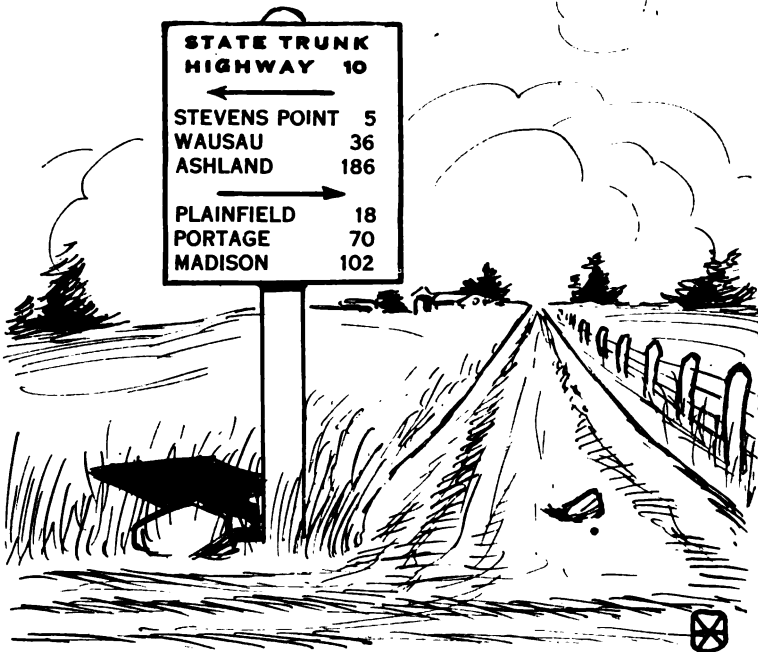


FIG. 3. Standard Direction Sign.

Placed at intersections on the Trunk Highway System to guide the traveling public. The best roads to places off the System are indicated by signs of like character, set at the proper intersections. The figures indicate dis-

PLATE D

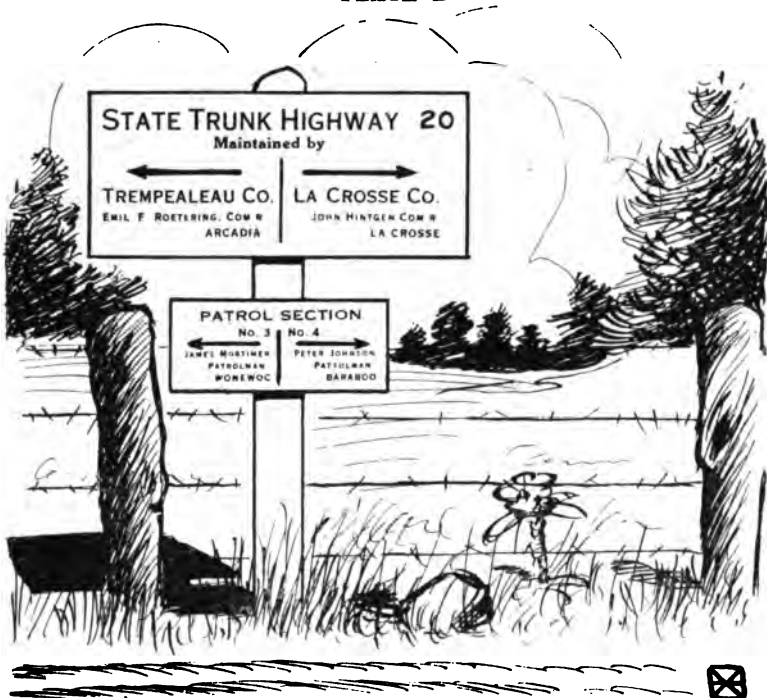


FIG. 1. Standard County Line and Patrol Section Signs.

Placed at all county and patrol section boundaries, to give the traveling public information as to who is directly in charge, and entitled to such credit or blame as the condition of the road may deserve.

STATE TRUNK HIGHWAY MARKING AND SIGNING

These cuts show the standard marking and signing system adopted and installed as required by law (Sec. 1313). For a detailed description of the system see article entitled "Underlying Principles Controlling the Laying Out, Marking and Maintaining of a State Trunk Highway Systems," pages 45 to 60 inclusive, and particularly pages 50 to 52 inclusive.

ADAMS COUNTY

Very little further progress in this county. The small amount of work that is being done is well done. The county highway commissioner is doing as well as could be expected with his maintenance considering the extremely sandy condition of most of the mileage.

As pointed out in a previous report very large expenditures are necessary in this county, which seemingly cannot be financed even with the help of the Federal Aid law.

ADAMS COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$939.45; Local, \$2,900.00; County, \$2,900.00; State, \$2,224.30; Advanced, \$1,400.00; Other, \$578.96; Total	\$10,942.71
Mileage: Graded and surfaced, 0.85 miles; Surfaced not graded, 0.55 miles; Graded not surfaced, 0.67 miles; total, 2.07 miles; Approximate number roads built, 4	
Grading: 1.52 mi. at \$740 per mile; 3,714 cu. yds. earth moved at 30 cts. per cu. yd.; average excavation per mile, 2,440 cu. yds.	1,126.90
Culverts: 4 metal culverts	119.15
Total cost per mile of all culverts, \$78	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 1.40 mi. at \$4,170; 9,169 sq. yds. at 78 cts.	7,228.71
Miscellaneous Items:	
Clearing and grubbing	77.10
Miscellaneous items	9.04
Total cost per mile of all miscellaneous items, \$57	
Total expenditures for 1916 road construction	8,560.90
Payments on road construction of preceding years..	28.90
Total road disbursements 1916	8,589.80
Balance carried forward (after deducting advances)..	952.91

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$209.35; Local, \$400.00; County, \$400.00; State, \$306.80; Total	\$1,316.15
Steel I-beam bridges: No. built, 1; Total length, 24 ft.; containing 75.8 cu. yds. concrete; 7,780 lbs. steel; cost per ft., \$58.15	
Total No. Bridges Built, 1; Total length, 24 ft.; Total expenditures	1,398.30
Deficit carried forward	82.15
Amount available 1918	30,983.28



FIG. 1. Note the manner in which Ashland County is attacking the maintenance problem. The fair truck operators are replacing the boys who are serving their country at the front.



FIG. 2. Patrolman Henry Bittner, Cayuga, Ashland County, at work on his section. Mr. Bittner is over three score years of age, but has proven himself to be one of the best patrolmen in the county.



FIG. 3. An 18 ft. concrete surface, a half mile in length, built by the Nash Motor Company for their own use in trying out their heavy motor trucks and cars. All such tests should be made on privately built and maintained roads.

ADAMS COUNTY
1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$952.91; Local, \$3,900.00; County, \$3,900.00; State, \$2,371.93; Advanced, \$1,350.00; Total	\$12,474.84
Mileage: Graded and surfaced, 0.86 miles; Graded not surfaced, 0.04 miles; total, 0.90 miles; Approximate number roads built, 3	
Grading: 0.90 miles at \$1,040 per mile; 4,860 cu. yds. earth moved at 19 cts. per cu. yd.; average excavation per mile, 5,400 cu. yds.	934.46
Culverts: 1 culvert repaired	23.93
Total cost per mile of all culverts, \$27	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.28 mi. at \$4,200; 2,613 sq. yds at 79 cts.	2,069.46
Pit run gravel: 0.58 mi. at \$650; 3,050 sq. yds at 13 cts.	384.00
Miscellaneous Items:	
Clearing and grubbing	142.50
Guard Rail: 900 lin. ft at 12 cts. per lin. ft.	105.96
Total cost per mile of all miscellaneous items, \$276	
Total expenditures for 1917 road construction	3,660.20
Balance carried forward (after deducting advances) ..	7,464.54

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$82.15; Local, \$650.00; County, \$650.00; State, \$395.33; Total	\$1,613.18
Reinforced Concrete Slab and Girder Bridges: No. built, 1; Total length, 25 ft.; containing 92.8 cu. yds. concrete; 6,270 lbs. steel; cost per ft., \$86.00; per cu. yd., \$23.20	2,150.00
Substructures only: No. built, 1; containing 70.0 cu. yds.; Total cost	968.28
Total No. bridges built, 2; Total length, 25 ft.; total expenditures	3,118.28
Deficit carried forward	1,505.10

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$14,088.02
Expenditures for state aid road construction	3,660.20
Expenditures for state aid bridge construction	3,118.28
Total state aid expenditures	6,778.58
Balance available for 1918 (after deducting advances of \$1,350.00)	5,959.44
Total appropriation for 1918 road and bridge construction	12,802.85
Amount available 1918	18,262.29

ASHLAND COUNTY

This county continues to do very excellent work, especially their maintenance work, and the north and south county trunk line, now a part of the State Trunk Highway No. 13, continues to be probably the longest stretch of excellent road in Wisconsin.

Work on other roads continues and all in all conditions in this county are excellent.

ASHLAND COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$39,312.96; Local, \$1,900.00; County, \$20,074.97; State, \$5,425.05;	
Total	\$66,712.98
Mileage: Graded and surfaced, 10.10 miles; Surfaced not graded, 0.98 miles; Graded not surfaced, 3.16 miles; total, 14.24 miles; Approximate number roads built, 9	
Grading: 13.26 miles at \$1,414 per mile; 30,373 cu. yds. earth moved at 62 cts. per cu. yd.; average excavation per mile, 2290 cu. yds.	18,752.99
Culverts: 14 conc. culverts; 286.3 cu. yds. conc. at \$10.63 per cu. yd.	3,041.24
18 metal culverts	828.62
Total cost per mile of all culverts, \$292	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 11.08 miles at \$667; 58500 sq. yds. at 13 cts.	7,394.25
Oil: 29,040 sq. yds.	743.25
Miscellaneous Items:	
Clearing and grubbing	1,154.57
Total expenditures for 1916 road construction	31,914.92
Balance carried forward	34,798.06

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$1,450.00; Total	\$1,450.00
Steel I-beam bridges: No. built, 1; Total length, 22 ft.; containing 72.2 cu. yds. concrete; 7,190 lbs. steel; cost per ft., \$41.65	
Total No. bridges built, 1; Total length, 22 ft.; Total expenditures	916.80
Balance carried forward	533.20

ASHLAND COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$34,798.06; Local, \$2,100.00; County, \$17,100.00; State, \$5,085.48;	
Total,	\$59, 083.54
Mileage: Graded and surfaced, 7.68 miles; surfaced not graded, 4.17 miles; Graded not surfaced, 2.75 miles; Total, 14.60 miles; Approximate number roads built, 8	
Grading: 10.43 miles at \$1,360 per mile; 28,025 cu yds. earth moved at 50 cts. per cu. yd.; average excavation per mile, 27 cu. yds.	14, 189.76
Culverts: 1 conc. culvert; 20.0 cu. yds. conc. at \$11.94 per cu. yd.	238.85
16 metal culverts	969.82
Total cost per mile of all culverts, \$116	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 11.85 miles at \$511; 77,966 sq. yds. at 10 cts.	8, 619.58
Miscellaneous Items:	
Clearing and grubbing	573.83
Guard rail: 984 lin. ft. at 14 cts per lin. ft.	138.37
Ditching and draining	446.10
Miscellaneous	2, 324.66
Total cost per mile of all miscellaneous items, \$384	
Total expenditures for 1917 road construction	27, 500.97
Balance carried forward	31, 582.51
Actual balance in state aid road fund	11, 492.47
Note: The difference in above balances, \$20,090.10, represents a balance in county funds from 1912, carried on books of Highway Dept., and of which no report has been received. This fund has probably been expended by the county.	

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$533.20; Local, \$500.00; County, \$500.00; State, \$500.00; Total	\$2, 033.20
Steel truss bridges: No. built, 1; Total length, 75 ft.; containing 258.3 cu. yds. concrete; 41,070 lbs. steel; cost per ft., \$63.90	
Total No. bridges built, 1; Total length, 75 ft.; Total expenditures	4, 794.44
Deficit carried forward	2, 761.24

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$41, 026.64
Expenditures for state aid road construction	27, 500.97
Expenditures for state aid bridge construction	4, 794.44
Total state aid expenditures	32, 295.41
Balance available for 1918	8, 731.23
Total appropriation for 1918 road and bridge construction	22, 252.05
Amount available 1918	30, 983.28

BARRON COUNTY

Work in this county continues well up to standard and the maintenance work is good.

The county has not yet started extensive surfacing but it should at an early date as the traffic on some of its highways merits this type of construction. In general the situation is excellent.

BARRON COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$422.23; Local, \$9,100.00; County \$9,100.00; State, \$7,062.92; Advanced, \$187.65; Other, \$291.47; Total	\$26,164.27
Net amount transferred from bridge fund	500.00
Net total available for road construction	26,664.27
Mileage:	
Graded not surfaced, 15.10 miles; Total, 15.10 miles; Approximate number roads built, 21	
Grading: 15.10 miles at \$1,171 per mile; 67,955 cu. yds. earth moved at 26 cts. per cu. yd.; average excavation per mile, 4,500 cu. yds.	17,632.28
Culverts: 46 conc. culverts; 528.9 cu. yds. conc. at \$9.07 per cu. yd.	4,787.79
12 metal culverts; 2 culverts repaired	528.68
Total cost per mile of all culverts, \$352	
Miscellaneous Items:	
Right of way purchased	421.00
Clearing and grubbing	860.13
Tile under drain	263.11
Guard rail: 2,232 lin. ft. at 19 cts. per lin. ft.	424.21
Ditching and draining	13.50
Riprap	15.00
Total cost per mile of all miscellaneous items \$132	
Total expenditures for 1916 road construction	24,995.70
Payments on road construction of preceding years ...	186.60
Total road disbursements 1916	25,182.30
Balance (after deducting advances)	1,294.32
Returned to cities of Barron and Chetek	150.47
Balance carried forward	1,143.85

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$3,439.81; Local, \$900.00; Countv. \$900.00; State, \$698.53; Total.....	\$5,938.34
Net amount transferred to road fund	500.00
Net total available for bridge construction	5,438.34
Steel I-beam bridges: No. built, 1; Total length, 22 ft.; containing 46.7 cu. yds. concrete; 8,830 lbs. steel; cost per ft., \$42.55.	936.00

BARRON COUNTY

Steel plate girder bridges: No. built, 1; Total length, 50 ft., containing 44.6 cu. yds. concrete; 38,320 lbs. steel; cost per ft., \$85.90	\$4,296.00
Substructures only: No. built, 1; containing 144.3 cu. yds.; Total cost	820.00
Total No. bridges built, 3; Total length, 72 ft.; Total expenditures	6,052.00
Deficit carried forward	613.66

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$1,143.85; Local, \$11,800.00; County, \$11,800.00; State, \$6,976.41; Other, \$640.70; Total	\$32,360.96
Mileage: Graded and surfaced, 0.91 miles; Graded not surfaced, 11.94 miles; Total 12.85 miles; Approximate number roads built, 20	
Grading: 12.85 miles at 1,350 per mile; 54,460 cu. yds. earth moved at 32 cts. per cu. yd.; average excavation per mile, 4,240 cu. yds.	17,387.46
Culverts: 30 conc. culverts; 391.3 cu. yds. conc. at \$12.55 per cu. yd.	4,912.31
5 metal culverts	297.28
Total cost per mile of all culverts, \$404	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Shale: 0.91 miles at \$658; 7,466 sq. yds. at 12 cts.	928.33
Miscellaneous Items:	
Clearing and grubbing	1,001.47
Guard rail: 4,085 lin. ft. at 22 cts. per lin. ft.	894.22
Miscellaneous	251.87
Total cost per mile of all miscellaneous items, \$167	
Total Expenditures for 1917 road construction	25,672.94
Balance carried forward	6,688.02

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$613.66; Local \$3,204.00; County, \$3,204.00; State \$1,894.27; Total	\$7,688.61
Reinforced concrete slab and girder bridges: No. built, 8; Total length, 124 ft., containing 561.3 cu. yds. concrete; 31,980 lbs. steel; cost per ft., \$80.40; per cu. yd., \$17.75	
Total No. bridges built, 8; Total length, 124 ft.; Total expenditures	9,972.31
Deficit carried forward	2,283.70

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$40,049.57
Expenditures for state aid road construction	25,672.94
Expenditures for state aid bridge construction	9,972.31
Total state aid expenditures	35,645.25
Balance available for 1918	4,404.32
Total appropriation for 1918 road and bridge construction	21,362.22
Amount available 1918	25,766.54



FIG. 1. A rather heavy grading job on Trunk Highway No. 11, near Rice Lake, Barron County.



FIG. 2. Two spans of 40 ft. clear opening, 20 ft. roadway, built in the city of Barron. This type of construction is very economical and pleasing in appearance. The first two span bridge of this type was built in 1916. Many have been built since.



FIG. 3. A view on Trunk Highway No. 10, Bayfield County, between Iron River and Ashland. This work was done by the Town of Barksdale. You will note that no cuts or fills were made, the main idea being to get a safe width for travel that would serve until more permanent work could be done. We find it necessary to temporarily build many miles of roads in northern

BAYFIELD COUNTY

Work in this county is still somewhat unsatisfactory. There has not up to this year been the cooperation on the part of the county highway commissioner which we could desire. The State Highway Commission has been blamed for certain decisions and for certain construction, and the county feeling of dissatisfaction seems to persist.

With a change in county highway commissioners, made this spring, somewhat better results have been secured, and we still hope for thorough cooperation. The change, if any, in general sentiment, is disappointing.

BAYFIELD COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$6,670.87; County, \$14,500.00; State, \$3,522.76; Total	\$24, 693.63
Mileage:	
Graded not surfaced, 19.00 miles; Total, 19.00 miles, (tractor work); Graded not surfaced, 7.61 miles; Total 7.61 miles; Approximate No. roads built, 5	
Grading: 7.61 miles at \$1,700 per mile; 32,299 cu. yds. earth moved at 40 cts. per cu. yd.; Average excavation per mile, 4,240 cu. yds.	12, 911.80
19.00 miles at \$175 per mile; (tractor work)	3, 346.90
Culverts: 29 conc. culverts; 391.8 cu. yds. conc. at \$10.00 per cu. yd.	3, 925.08
Miscellaneous Items:	
Clearing and grubbing	1, 035.00
Ditching and draining	80.00
Riprap	1, 642.95
Total cost per mile of all miscellaneous items, \$362	
Total expenditure for 1916 road construction	22, 941.23
Balance carried forward	1, 752.40

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$5,525.62; County, \$6,300.00; State, \$1,530.59; Total	\$13, 356.21
Reinforced concrete slab and girder bridges; No. built 2; Total length, 36 ft.; containing, 139.3 cu. yds. concrete; 8,400 lbs. steel; cost per ft., \$60.85; per cu. yd. \$15.70	2,190.00
Steel I-beam bridges: No. built, 4; Total length, 94 ft.; containing 261.1 cu. yds. concrete; 34,030 lbs. steel; cost per ft., \$55.20	5,191.00
Steel plate girder bridges: No. built, 2; Total length, 115 ft.; containing 319.0 cu. yds. concrete; 53,660 lbs. steel; cost per ft., \$52.90	6,088.00
Total No. bridges built, 8; Total length, 245 ft.; Total expenditures	13, 469.00
Deficit carried forward	112.79



FIG. 1. A typical Bayfield County earth road properly maintained.



FIG. 2. A 20 ft. reinforced concrete arch bridge on Trunk Highway No. 15, Brown County. The arch was the earliest type of permanent bridge. Here we are using the latest construction material in getting back to first principles.



FIG. 3. A 70 ft. reinforced concrete arch span, 24 ft. clear roadway, built on Trunk Highway No. 15 in Brown County. The first bridge in the state completed with Federal Aid. The concrete pavement extending over the bridge connects with the Outagamie County concrete construction. (See Brown County, page 24)

BAYFIELD COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$1,752.40; County, \$24,900.00; State, \$4,395.04; Other, \$3,691.64; Total	\$34,739.08
Mileage: Graded not surfaced, 4.50 miles; Total 4.50 miles; Approximate number roads built, 4	
Grading: 4.50 miles at \$2,630 per mile; 23,980 cu. yds. earth moved at 60 cts. per cu. yd.; average excavation per mile, 5,330 cu. yds.	14,496.34
Culverts: 14 conc. culverts; 154.5 cu. yds. conc. at \$14.12 per cu. yd.	2,182.91
Total cost per mile of all culverts, \$480	
Miscellaneous Items:	
Clearing and grubbing	2,714.87
Riprap	2,942.68
Total cost per mile of all miscellaneous items \$1,250	
Total expenditures for 1917 road construction	22,336.80
Balance carried forward	12,402.28

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$112.79; County, \$3,590.00; State, \$633.66; Total,	\$4,110.87
Reinforced concrete slab and girder bridges: No. built, 2; Total length, 28 ft.; containing, 148.6 cu. yds. concrete; 10,150 lbs. steel; cost per ft., \$113.20; per cu. yd., \$21.30	
Total No. bridges built, 2; Total length, 28 ft.; total expenditures	3,170.00
Balance carried forward	940.87

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction 1917	\$38,849.95
Expenditures for state aid road construction	22,336.80
Expenditures for state aid bridge construction	3,170.00
Total state aid expenditures	25,506.80
Balance available for 1918	13,343.15
Total appropriation for 1918 road and bridge construction	19,498.72
Amount available for 1918	32,841.87

BROWN COUNTY

This county has made considerable progress in the biennium. No fault can be made with the appropriations made by the county board. A bond issue of \$175,000, made in 1917, for placing in condition certain of the main roads, has helped materially. The maintenance has been fairly good.

On the whole distinct progress is being made and this county should soon assume a position in road work commensurate with its wealth and importance.

BROWN COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$50,336.64; Local \$36,200.00; County, \$36,200.00; State, \$14,435.32; Advanced, \$8,468.58; Other, \$780.39; Total	\$45,747.65
Mileage: Graded and surfaced, 4.42 miles; Surfaced not graded, 2.65 miles; Graded not surfaced, 4.04 miles; Total 11.11 miles; Approximate number roads built, 19	
Grading: 8.46 miles at \$956 per mile; 23,995 cu. yds. earth moved at 34 cts. per cu. yd.; average excavation per mile, 2,830 cu. yds.	8,088.00
Culverts: 23 conc. culverts; 2,847 cu. yds. conc. at \$10.90 per cu. yd.	3,101.07
1 culvert repaired	15.25
Total cost per mile of all culverts, \$368	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 5.96 miles at \$2,755; 31,450 sq. yds. at 52 cts.	17,614.18
Crushed gravel: 0.51 miles at \$2,355; 2,700 sq. yds. at 44 cts.	1,202.11
Pit run gravel: 0.55 miles	3,009.18
Concrete: 0.05 miles; 240 sq. yds. at \$1.70	407.61
Miscellaneous Items:	
Guard rail: 2,725 lin. ft. at 24 cts. per lin. ft.	674.71
Riprap	381.21
Miscellaneous	272.11
Total cost per mile of all miscellaneous items, \$157	
Total expenditures for 1916 road construction	34,765.43
Balance carried forward (after deducting advances) ..	2,513.64

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$1,644.85; Local, \$6,700.00; County, \$6,700.00; State, \$2,671.73; Total	\$17,716.58
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 63 ft.; containing, 309.7 cu. yds. concrete; 14,760 lbs. steel; cost per ft., \$70.80; per cu. yd., \$14.40	
Total No. bridges built, 3; Total length, 63 ft.; Total expenditures	4,457.59
Balance carried forward	13,258.99

BROWN COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$2,518.64; Local, \$16,550.00; County, \$16,550.00; State, \$15,229.30; Advanced, \$8,053.02; Other, \$2,248.57; Bonds, \$6,602.00; Total	\$67,746.53
Mileage: Graded and surfaced, 2.52 miles; Surfaced not graded, 2.59 miles; Graded not surfaced, 1.91 miles; Total, 7.02 miles; Approximate number roads built, 12	
Grading: 4.43 miles at \$1,292 per mile; 13,600 cu. yds. earth moved at 48 cts. per cu. yd.; average excavation per mile, 3,070 cu. yds.	6,574.81
Culverts: 12 conc. culverts; 147.3 cu. yds. conc. at \$15.12 per cu. yd.	2,228.07
Total cost per mile of all culverts, \$502	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone, 4.27 miles at \$4,040; 24,897 sq. yds. at 77 cts.	19,715.38
Pit run gravel: 0.84 miles at \$2,001; 4,410 sq. yds. at 38 cts.	2,321.68
Miscellaneous Items:	
Miscellaneous	1,057.23
Total cost per mile of all miscellaneous items, \$239	
Total expenditures for 1917 road construction	31,897.17
Balance carried forward (after deducting advances) ..	27,796.34
Returned to Village of Pulaski	1,200.00
	\$26,596.34

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$13,258.99; Local, \$2,750.00; County, \$2,750.00; State, \$2,530.55; Total	\$21,289.54
Reinforced concrete arch bridge: No. built, 1; Total length, 30 ft.; containing 169.0 cu. yds. concrete; 5,070 lbs. steel; cost per ft., \$89.15; per cu. yd., \$15.80	2,675.37
Steel plate girder bridges: No. built, 1; Total length, 103 ft., containing 296.0 cu. yds. concrete; 150,350 lbs. steel; cost per ft., \$161.00	16,585.75
Total No. bridges built, 2; Total length, 133 ft.; Total expenditures	19,261.12
Balance carried forward	2,028.42

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917.	\$37,836.07
Expenditures for state aid road construction	31,897.17
Expenditures for state aid bridge construction	19,261.12
Total state aid expenditures	51,158.29
Balance available for 1918 (after deducting advances of \$8,053.02)	28,624.76
Total appropriation for 1918 road and bridge construction	47,918.60
Amount available 1918	76,543.36

BUFFALO COUNTY

Work in the county continues rather less than in other counties of like wealth. Some progress is being made and in parts of the county road sentiment is developing fast.

The construction work is good and the maintenance good. The general situation in this county may be described as promising.

BUFFALO COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$19,253.80; Local, \$9,800.00; County, \$9,800.00; State, \$5,470.38; Other, \$149.05; Total	\$38,473.23
Mileage: Graded and surfaced, 3.59 miles; Surfaced not graded, 2.72 miles; Graded not surfaced, 6.01 miles; Total 12.32 miles; Approximate number roads built 24	
Grading: 9.60 miles at \$1,208 per mile; 49,000 cu. yds. earth moved at 27 cts. per cu. yd.; average excavation per mile, 5,100 cu. yds.	12,129.37
Culverts: 29 conc. culverts; 812.4 cu. yds. conc. at \$8.25 per cu. yd.	2,580.19
3 metal culverts; 2 culverts repaired	401.20
Total cost per mile of all culverts, \$310	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 2.31 miles at \$2,930; 13,189 sq. yds. at 56 cts.	7,322.28
Shale: 4.00 miles at \$1,077; 22,355 sq. yds. at 20 cts. ...	4,559.65
Miscellaneous Items:	
Right of way purchased	300.00
Clearing and grubbing	16.00
Guard rail: 11,611 lin. ft. at 24 cts. per lin. ft.	2,749.57
Miscellaneous	1,543.21
Total cost per mile of all miscellaneous items, \$480	
Total expenditures for 1916 road construction	31,592.47
Payments on road construction of preceding years	10 00
Total road disbursements 1916	31,602.47
Balance	1,870.76
Payments made on 1915 contracts	129.63
Balance carried forward	1,741.13

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$1,817.19; Local, \$600.00; County, \$600.00; State, \$352.92; Total ...	\$3,370.11
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 32 ft.; containing 178.7 cu. yds. concrete; 6,530 lbs. steel; cost per ft., \$60.15; per cu. yd., \$10.75	1,926.00
Steel I-beam bridges: No. built, 9; Total length, 202 ft.; containing 559.8 cu. yds. concrete; 81,850 lbs. steel; cost per ft., \$50.00	10,110.00
Total No. bridges built, 12; Total length, 234 ft.; Total expenditures	12,036.00
Deficit carried forward	8,665.89

BUFFALO COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$1,741.13; Local, \$13,800.00; County, \$13,800.00; State, \$4,081.79; Advanced, \$1,200.00; Total	\$34,622.92
Mileage: Graded and Surfaced, 1.53 miles; Surfaced not graded, 3.88 miles; Graded not surfaced, 4.60 miles; Total 10.01 miles; Approximate number roads built, 19	
Grading: 6.13 miles at \$1,685 per mile; 38,490 cu. yds. earth moved at 27 cts. per cu. yd.; average excavation per mile, 6,280 cu. yds.	10,373.21
Culverts: 26 conc. culverts; 276.7 cu. yds. conc. at \$10.57 per cu. yd.	2,987.52
Total cost per mile of all culverts, \$487	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 136 miles at \$3,570; 7,318 sq. yds. at 68 cts.	6,118.16
Shale: 4.05 miles at \$1,188; 23,111 sq. yds. at 22 cts.	5,235.10
Miscellaneous Items:	
Right of way purchased	800.00
Clearing and grubbing	70.05
Guard rail: 4,170 lin. ft. at 31 cts. per lin. ft.	1,305.57
Riprap	50.00
Miscellaneous	525.28
Total cost per mile of all miscellaneous items, \$448	
Total expenditures for 1917 road construction	27,464.89
Balance carried forward (after deducting advances) ..	5,958.03

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$8,665.89; Local, \$6,885.00; County, \$6,885.00; State, \$2,036.47; Total	\$7,140.58
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 115 ft.; containing 498.8 cu. yds. concrete; 34,300 lbs. steel; cost per ft., \$88.95; per cu. yd., \$20.50	
Total No. bridges built, 4; Total length, 115 ft.; Total expenditures	10,220.57
Deficit carried forward	3,079.99

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917 ..	\$41,763.50
Expenditures for state aid road construction	27,464.89
Expenditures for state aid bridge construction	10,220.57
Total state aid expenditures	37,685.46
Balance available for 1918 (after deducting advances of \$1,200.00)	2,878.04
Total appropriation for 1918 road and bridge construction	45,785.01
Amount available 1918	48,663.05



FIG. 1. A scene along the Mississippi River on Trunk Highway No. 25, Buffalo Co.



FIG. 2. A girder bridge of six 40 ft. spans, 24 ft. roadway, built at Potter, Calumet County, on Trunk Highway No. 18. Approximate cost \$24,000.00. This bridge, which is built on very soft soil, is supported by timber piling driven to solid foundation. Some of the piles are 60 ft. long.



FIG. 3. A view in Clark County, showing a curved culvert end wall placed at a road intersection. This increases the space available for travel.

BURNETT COUNTY

This was one of the slowest counties to start operations under the State Aid law. Progress is now fairly good.

On the whole conditions are susceptible to much improvement and it would seem that some of the more prominent citizens of the county should get more aggressively behind the road movement.

BURNETT COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$3,679.41; Local, \$5,400.00; County, \$5,900.00; State, \$1,852.33; Total	\$16,831.74
Mileage: Graded and surfaced, 2.62 miles; Surfaced not graded, 0.23 miles; Graded not surfaced, 11.96 miles; Total, 14.81 miles; Approximate number roads built, 16	
Grading: 14.58 miles at \$650 per mile; 54,000 cu. yds. earth moved at 18 cts. per cu. yd.; average excavation per mile, 3,700 cu. yds.	9,495.51
Culverts: 6 conc. culverts; 80.3 cu. yds. conc. at \$9.80 per cu. yd.	788.39
11 metal culverts	283.81
Total cost per mile of all culverts, \$73	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings, 0.78 miles	982.07
Pit run gravel; 1.08 miles at \$540; 10,470 sq. yds. at 10 cts.	1,168.52
Concrete: 0.09 miles at 6,420; 2,785 sq. yds. at \$1.21 ...	3,381.41
Miscellaneous Items:	
Clearing and grubbing	839.05
Guard rail	12.00
Ditching and draining	26.00
Miscellaneous	139.45
Total cost per mile of all miscellaneous items, \$73	
Total expenditures for 1916 road construction	17,167.21
Deficit carried forward	335.47

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Local, \$1,050.00; County, \$1,050.00; State, \$360.17; Total	\$2,460.17
Steel I-beam bridges: No. built, 2; Total length, 38 ft.; containing 127.8 cu. yds. concrete; 10,890 lbs. steel; cost per ft., \$37.90	1,440.00
Steel plate girder bridges: No. built, 1; Total length, 60 ft., containing 84.1 cu. yds. concrete; 27,700 lbs. steel; cost per ft., \$31.15	1,869.00
Total No. bridges built, 3; Total length, 98 ft.; Total expenditures	3,309.00
Deficit carried forward	548.83

BURNETT COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$335.47; Local, \$10,-300.00; County, \$10,300.00; State, \$2,430.66; Other, \$2,538.93; Total	\$25, 234.12
Mileage: Graded and surfaced, 0.59 miles; Graded not surfaced, 4.91 miles; Total, 5.50 miles; Approximate number roads built, 12	
Grading: 5.50 miles at \$1,350 per mile	8, 831.96
Culverts: 8 conc. culverts; 80.0 cu. yds. conc. at \$10.50 per cu. yd.	847.46
Total cost per mile of all culverts, \$154	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 0.50 miles at \$820 per mile	420.50
Concrete: 0.09 miles at \$9,610; 2,338 sq. yds. at \$1.83..	4, 227.01
Miscellaneous Items:	
Right of way purchased	125.00
Clearing and grubbing	816.95
Miscellaneous	120.29
Total cost per mile of all miscellaneous items, \$193	
Total expenditures for 1917 road construction	15, 389.17
Balance carried forward	9, 844.95

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$848.83; Local, \$675.00; County, \$675.00; State, \$159.30; Total	\$660.47
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 14 ft.; containing 57.3 cu. yds. concrete; 2,900 lbs. steel; cost per ft., \$67.50; per cu. yd. \$16.45	
Total No. bridges built, 1; Total length, 14 ft.; Total expenditures	944.00
Deficit carried forward	283.53

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$25, 894.59
Expenditures for state aid road construction	15, 389.17
Expenditures for state aid bridge construction	944.00
Total state aid expenditures	16, 333.17
Balance available for 1918	9, 561.42
Total appropriation for 1918 road and bridge construction	27, 095.57
Amount available 1918	36, 656.99

CALUMET COUNTY

Some progress is being made in this county. Appropriations run small considering the valuation. The county highway commissioner is doing good work and getting much better support than previously from the county board. This county is ripe for further development.

CALUMET COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$1,867.48; Local, \$3,700.00; County, \$10,750.00; State, \$8,398.65; Advanced, \$10,500.00; Other, \$105.94; Total.....	\$35,322.07
Mileage: Graded and surfaced, 3.67 miles; Surfaced not graded, 0.49 miles; Graded not surfaced, 1.42 miles; Total, 5.58 miles; Approximate number roads built, 7.	
Grading: 5.99 miles at \$900 per mile; 11,140 cu. yds. earth moved at 41 cts. per cu. yd.; average excavation per mile, 2,190 cu. yds.....	4,591.89
Culverts: 12 conc. culverts; 195.8 cu. yds. conc. at \$10.38 per cu. yd.....	2,033.86
Total cost per mile of all culverts, \$400	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 2.99 miles at \$2,770; 16,466 sq. yds. at 52 cts.....	8,601.83
Concrete: 1.17 miles at \$6,860; 7,390 sq. yds. at \$1.30..	9,607.85
Miscellaneous Items:	
Clearing and grubbing.....	239.32
Miscellaneous	921.36
Total cost per mile of all miscellaneous items, \$229	
Total expenditures for 1916 road construction	25,996.11
Deficit carried forward (after deducting advances) ..	1,174.04

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$755.00; Total.....	\$755.00
Balance carried forward	755.00

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$1,174.04; Local, \$9,200.00; County, \$9,200.00; State, \$8,076.15; Other, \$0.10; Total	\$25,302.21
Net total available for road construction	23,827.01
Mileage: Graded and surfaced, .27 miles; Surfaced not graded, 0.51 miles; Graded not surfaced, 0.77 miles; Total, 1.55 miles; Approximate number roads built, 3	

CALUMET COUNTY

Grading: 1.04 miles at \$1,046 per mile; 2,000 cu. yds. earth moved at 55 cts. per cu. yd.; average excavation per mile, 1,920 cu. yds.	\$1,088.23
Culverts: 5 conc. culverts, 63.3 cu. yds. conc. at \$16.00 per cu. yd.	1,009.86
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing) Crushed stone: 9.78 miles at \$2,400; 4,100 sq. yds. at 46 cts.	1,919.86
Miscellaneous Items: Clearing and grubbing	10.87
Tile under drain	104.00
Total cost per mile of all miscellaneous items, \$110	
Total expenditures for 1917 road construction	4,132.82
Balance carried forward	19,694.19

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$755.00; Local, \$1000.00; County, \$1,0000.00; State, \$877.84; Total	\$3,632.84
Net amount transferred from road fund	1,475.20
Net total available for bridge construction	5,108.04
Reinforced concrete slab and girder bridges: No. built, 2; total length, 26 ft.; containing, 128.6 cu. yds. concrete; 6,500 lbs. steel; cost per ft., 76.90; per cu. yd., \$15.55	1,999.00
Reinforced concrete arch bridges: No. built, 1; total length, 14 ft.; containing 839 cu. yds. concrete; 3,000 lbs. steel; cost per ft., 105.35; per cu. yd., \$17.75 ...	1,475.00
Total No. bridges built, 3; Total length, 40 ft.; total expenditures	3,474.00
Balance carried forward	1,634.04

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$28,935.95
Expenditures for state aid road construction	4,132.82
Expenditures for state aid bridge construction	3,474.00
Total state aid expenditures	7,606.82
Balance available for 1918	21,328.23
Total appropriation for 1918 road and bridge construction	21,692.00
Amount available 1918	43,020.23

CHIPPEWA COUNTY

This county this year will probably complete the surfacing of its county trunk highway system, a total length of 48 miles. Construction on this system was started in 1914 and its completion in five years shows what can be done with moderate funds if work is concentrated. Construction has been good in this county and the maintenance is also good.

On the whole, work in this county has given excellent results, and the general conditions and sentiment is ahead of that in the surrounding counties.

CHIPPEWA COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$2,254.73; County, \$27,000.00; State, \$9,531.45; Other, \$1,076.10; Total	\$39,862.28
Net amount transferred to bridge fund	4,185.50
Net total available for road construction	35,676.78
Mileage: Graded and surfaced, 7.12 miles; Surfaced not graded, 1.82 miles; Graded not surfaced, 5.25 miles; Total 14.19 miles; Approximate number roads built, 5	
Grading: 12.37 miles at \$1,022 per mile; 35,605 cu. yds. earth moved at 35 cts. per cu. yd.; average excavation per mile, 3,165 cu. yds.	12,649.29
Culverts: 20 conc. culverts; 253.6 cu. yds. conc. at \$8.66 per cu. yd.	2,197.96
2 metal culverts	111.44
Total cost per mile of all culverts, \$186	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 3.58 miles at \$2,858; 18,880 sq. yds at 54 cts.	10,230.99
Pit run gravel: 5.36 miles at \$1,581; 28,300 sq. yds. at 30 cts.	8,473.90
Road oil: 119,800 sq. yds. at 4 cts.	4,996.54
Miscellaneous Items:	
Right of way purchased	675.00
Clearing and grubbing	657.62
Tile underdrain	105.08
Curb and gutter	537.05
Ditching and draining	64.12
Riprap	47.90
Total cost per mile of all miscellaneous items, \$168	
Total expenditures for 1916 road construction	40,746.89
Deficit	5,070.11
Correction .....	.07
Deficit carried forward	5,070.18



FIG. 1. A view on Trunk Highway No. 11 near Eagle Point, Chippewa County. Note the well maintained surface.



FIG. 2. A bridge over a branch of Lake Wissota on State Trunk Highway No. 16, near Chippewa Falls. The center span was originally built about 30 feet lower. The construction of the dam made necessary the reconstruction of the bridge.



FIG. 3. A well maintained gravel road on a steep grade in Chippewa County. Note the concrete curb and gutter.

CHIPPEWA COUNTY-**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Deficit 1915, \$756; Total deficit.....	\$756.16
Net amount transferred from road fund	4,185.60
Net total available for bridge construction	3,429.34
Steel I-beam bridges: No. built, 1; Total length, 20 ft.; containing 69.6 cu. yds. concrete; 7,500 lbs. steel; cost per ft., \$40.00	800.00
Steel truss bridges: No. built, 1; Total length, 59 ft.; containing 18.0 cu. yds. concrete; 4,400 lbs. steel; cost per ft., \$6.40	378.00
Steel plate girder bridges: No. built, 2; Total length, 85 ft., containing 173.7 cu. yds. concrete; 42,740 lbs. steel; cost per ft., \$34.80	2,958.00
Total No. bridges built, 4; Total length, 164 ft.; Total expenditures	4,136.00
Deficit carried forward	706.66

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$5,070.18; County, \$25,000.00; State, \$10,233.91; Other, \$4,136.96; Total	\$34,300.69
Net amount transferred to bridge fund	889.00
Net total available for road construction	33,411.69
Mileage: Graded and surfaced, 7.98 miles; Surfaced not graded, 4.00 miles; Total 11.98 miles; Approximate number roads built, 3	
Grading: 7.98 miles at \$1,184 per mile; 25,270 cu. yds. earth moved at 37 cts. per cu. yd.; average excava- tion per mile, 3,160 cu. yds.	9,443.47
Culverts: 18 conc. culverts; 255.4 cu. yds. conc. at \$10.85 per cu. yd.	2,772.12
2 culverts repaired	88.57
Total cost per mile of all culverts, \$358	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 2.67 miles at \$2,540; 17,600 sq. yds. at 51 cts.	8,451.77
Crushed gravel: 3.49 miles at 1,448; 18,400 sq. yds. at 27 cts.	5,050.78
Pit run gravel: 5.82 miles at \$2,235; 30,700 sq. yds. at 42 cts.	13,008.04
Miscellaneous Items:	
Right of way purchased	298.80
Clearing and grubbing	21.25
Guard rail: 1,872 lin. ft. at 19 cts. per lin. ft.	357.86
Miscellaneous	68.89
Total cost per mile of all miscellaneous items, \$94	
Total expenditures for 1917 road construction	39,561.55
Deficit carried forward	6,149.86

CHIPPEWA COUNTY

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$706.66; Total deficit....	\$706.66
Net amount transferred from road fund	889.00
Net total available from road fund	182.34
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 10 ft.; containing 54.3 cu. yds. con- crete; 2,210 lbs. steel; cost per ft., \$88.90; per cu. yd., \$16.35	
Total No. bridges built, 1; Total length, 10 ft.; Total ex- penditures	889.00
Deficit carried forward	706.66

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$32,594.03
Expenditures for state aid road construction	39,561.55
Expenditures for state aid bridge construction	889.00
Total state aid expenditures	40,450.55
Deficit for 1918	6,856.52
Total appropriation for 1918 road and bridge construc- tion	27,625.23
Amount available 1918	20,768.71

CLARK COUNTY

This county continues to do very excellent work and is ripe for much further development.

The concentration recommended in the previous biennial report has been accomplished by the county board. Conditions in this county must be considered as excellent.

The County Trunk Line adopted in 1916 is now maintained by patrolmen in the same manner as the State Trunk Highway System and the results are very good.

CLARK COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$2,128.18; Local, \$13,518.76; County, \$13,518.76; State, \$8,089.04; Advanced, \$377.32; Other, \$1,112.75; Total	\$38,744.31
Net amount transferred from bridge fund	3,804.78
Net total available for road construction	42,549.59
Mileage: Graded and surfaced, 9.29 miles; Surfaced not graded, 9.28 miles; Graded not surfaced, 13.40 miles; Total, 31.88 miles; Approximate number roads built, 46	
Grading: 22.60 miles at \$550 per mile; 57,063 cu. yds. earth moved at 22 cts. per cu. yd.; average excavation per mile, 2,525 cu. yds.	12,630.41
Culverts: 39 conc. culverts; 425.8 cu. yds. conc. at \$8.19, per cu. yd.	3,485.02
14 metal culverts	425.63
Total cost per mile of all culverts, \$173	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings, 2.51 miles at \$423 per mile	1,215.57
Crushed stone: 0.47 miles at \$2,935; 3,081 sq. yds. at 55 cts.	1,702.84
Pit run gravel 10.12 miles at \$1,007; 55,494 sq. yds. at 19 cts.	10,614.57
Disintegrated granite: 5.38 miles at \$1,030; 33,082 sq. yds. at 19 cts.	6,453.64
Miscellaneous items:	
Clearing and grubbing	139.52
Tile underdrain	94.08
Guard rail: 2,139 lin. ft. at 12 cts. per lin. ft.	250.03
Ditching and draining	189.78
Riprap	53.20
Miscellaneous items	489.09
Total cost per mile of all miscellaneous items, \$54	
Total expenditures for 1916 road construction	37,743.38
Balance (after deducting advances)	4,428.89
Paid to Marathon county (Colby work)	131.38
Balance carried forward	4,297.51



FIG. 1. A view on Trunk Highway No. 18, Clark County, before maintenance work began in the spring of 1918.



FIG. 2. The same road as shown in Fig. No. 1 after two month's patrol maintenance, no new material being added. The road was shaped up with a light road grader and gone over frequently with a road grader or planer which produced a very satisfactory surface to travel.



FIG. 3. A disintegrated granite surface in Clark County well maintained.

CLARK COUNTY**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1915, \$201.58; Local, \$2,100.00;	
County, \$2,100; State, \$1,256.56; Total	\$5, 658.14
Net amount transferred to road fund	3, 804.78
Net total available for bridge construction	1, 853.36
Reinforced concrete slab and girder bridges: No. built 3;	
Total length, 30 ft.; containing, 124.3 cu. yds. concrete;	
6,030 lbs. steel; cost per ft., \$31.15; per cu. yd., \$7.50	934.58
Steel I-beam bridges: No. built, 1; Total length, 22 ft.;	
containing 37.2 cu. yds. concrete; 7,040 lbs. steel; cost per ft., \$25.50	569.71
Steel truss bridges: No. built, 1; Total length, 73 ft.; containing 22.0 cu. yds. concrete; 41,200 lbs. steel; cost per ft., \$22.15	1, 616.66
Total number bridges built, 5; Total length, 125 ft.; total expenditures	3, 111.95
Deficit carried forward	1, 258.59

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$4,297.51; County, \$54,737.94; State, \$10,163.72; Other, \$288.98; Total..	\$69, 487.25
Mileage: Graded and surfaced, 11.38 miles; Surfaced not graded, 5.73 miles; Graded not surfaced, 5.73 miles; Total, 22.84 miles; Approximate number roads built, 16	
Grading: 17.11 miles at \$494 per mile; 30,182 cu. yds. earth moved at 28 cts. per cu. yd.; average excavation per mile, 1,763 cu. yds.	8, 470.46
Culverts. 21 conc. culverts; 248.6 cu. yds. conc. at \$10.55 per cu. yd.	2, 642.24
Total cost per mile of all culverts, \$153	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 8.11 miles at \$1,342; 46,395 sq. yds. at 25 cts.	12, 581.22
Road oil: 53,415 sq. yds. at 4 cts.	2, 019.59
Disintegrated granite: 9.00 miles at \$1,464; 48,298 sq. yds. at 28 cts.	13, 387.99
Miscellaneous Items:	
Clearing and grubbing	280.05
Ditching and draining	85.00
Miscellaneous	167.99
Total cost per mile of all miscellaneous items, \$31	
Total expenditures for 1917 road construction	39, 634.54
Balance carried forward	29, 852.71

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$1,258.59; Total deficit...	\$1, 258.59
Deficit carried forward	1, 258.59



FIG. 1. The manner in which the State Trunk Highway system was marked, where there were no telephone poles, or where the poles were in such condition that we could not stencil a marker on them in a satisfactory manner.



FIG. 2. A fifteen foot gravel road in Clark County. Note the clean cut ditch lines.



FIG. 3. A typical concrete slab bridge of short span built in Columbia County. An economical and efficient structure.

CLARK COUNTY**STATEMENT JANUARY 1, 1918**

Funds available for road and bridge construction, 1917..	\$68,228.66
Expenditures for state aid road construction	39,624.54
Total state aid expenditures	39,624.54
Balance available for 1918	28,594.12
Total appropriation for 1918 road and bridge construction	25,306.17
Amount available 1918	53,900.29

COLUMBIA COUNTY

This county, one of the oldest good roads counties in Wisconsin, continues to press on. The construction work is probably up to the State average and the maintenance work is fairly good.

Well aroused to the importance of good roads the people of this county will give a good account of themselves in future years.

COLUMBIA COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$9,980.46; Local, \$27,925.05; County, \$27,925.05; State \$14,222.92; Advanced, \$5,960.37; Other, \$524.11; Total	\$86,537.96
Mileage: Graded and surfaced, 20.40 miles; Surfaced not graded, 2.88 miles; Graded not surfaced, 3.13 miles; Total, 26.41 miles; Approximate number roads built, 50	
Grading: 23.53 miles at \$970 per mile; 57,000 cu. yds. earth moved at 40 cts. per cu. yd.; average excavation per mile, 2,400 cu. yds.	22,845.19
Culverts: 72 conc. culverts; 750.0 cu. yds. conc. at \$7.80 per cu. yd.	5,849.59
Total cost per mile of all culverts, \$248	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 8.59 miles at \$2,280; 46,314 sq. yds. at 45 cts.	21,385.94
Crushed gravel: 10.57 miles at \$1,514; 55,678 sq. yds. at 29 cts.	16,030.37
Pit run gravel: 4.12 miles at \$1,230; 21,750 sq. yds. at 23 cts.	5,070.83
Concrete: 265 sq. yds. at \$1.47	390.97
Miscellaneous Items:	
Tile underdrain	310.02
Guard rail: 1,690 lin. ft. at 21 cts. per lin. ft.	350.12
Miscellaneous	189.27
Total cost per mile of all miscellaneous items, \$36	
Total expenditures for 1916 road construction	72,422.30
Balance (after deducting advances)	8,155.29
Returned to general fund	1,230.00
Balance carried forward	6,925.29



FIG. 1. A relocation in Columbia County known as the Hand Hill. The old road contained a 10% grade and a condition under which it was very difficult to handle the drainage. The relocation has a maximum 5% grade and is 250 feet shorter in a distance of one-half mile. The alignment is better and the surface water can be taken care of without any danger to the road. In this case an appreciable improvement of the grade was impossible without the relocation.



FIG. 2. A view of a standard 36,000 gallon oil storage tank built at Portage, Columbia Co. This is a reinforced concrete tank 20 ft. in diameter and 20 ft. in height, with concrete roof. The cost was practically \$1,000. The tank was built during the season of 1918, under the supervision of J. T. Henton, County Highway Commissioner.

COLUMBIA COUNTY**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Deficit 1915, \$812.33; Local, \$250.00;	
County, \$250.00 State, \$122.93; Total deficit	\$189.40
Reinforced concrete slab and girder bridges: No. built 2;	
Total length, 38 ft.; containing, 178.4 cu. yds. concrete;	
8,790 lbs. steel; cost per ft., \$45.40; per cu. yd., \$9.65	
Total No. bridges built, 2; Total length, 38 ft.; total expenditures	1,725.00
Deficit carried forward	1,914.40

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$6,925.29; Local, \$36,340.84; County, \$36,340.84; State, \$14,188.89;	
Net total available for road construction	102,633.30
Net amount transferred from bridge fund	100.17
Net total available for road construction	\$102,633.30
Mileage: Graded and surfaced, 23.19 miles; Surfaced not graded, 1.19 miles; Graded not surfaced, 3.36 miles; Total, 27.74 miles; Approximate number roads built, 28	
Grading: 26.55 miles at \$890 per mile; 59,017 cu. yds. earth moved at 40 cts. per cu. yd.; average excavation per mile, 2,220 cu. yds.	25,803.75
Culverts: 64 conc. culverts; 866.6 cu. yds. conc. at \$9.85 per cu. yd.	8,557.58
Total cost per mile of all culverts, \$322	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 10.72 miles at \$2,278; 57,884 sq. yds. at 45 cts.	26,470.07
Crushed gravel: 4.90 miles at \$2,265; 25,917 sq. yds. at 44 cts.	11,502.16
Pit run gravel: 876 miles at \$1,340; 46,220 sq. yds. at 25 cts.	11,713.46
Miscellaneous Items:	
Right of way purchased	1,205.00
Clearing and grubbing	614.57
Tile underdrain	61.09
Guard rail	15.70
Miscellaneous	169.15
Total cost per mile of all miscellaneous items, \$78	
Total expenditures for 1917 road construction	86,111.83
Balance (after deducting advances)	9,694.76
Returned to local units	245.85
Net balance carried forward	9,448.91

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$1,914.40; Local, \$1,500.00;	
County, \$1,500.00; State, \$569.98; Total	\$1,655.58
Net amount transferred to road fund	100.17
Net total available for bridge construction	1,555.41
Balance carried forward	1,555.41



FIG. 1. A section of the tar-hay experiment which was constructed by the State Highway Commission in 1917. This view was taken about one month after the tar-hay surface had been placed. (See page 35)



FIG. 2. The manner in which the tar was applied in the construction of the tar-hay road shown above.



FIG. 3. The same section of the tar-hay experiment as shown in Figure 1, taken in the spring of 1918 after the snow had melted from the road surface. The results to date are better than expected.

COLUMBIA COUNTY**STATEMENT JANUARY 1, 1918**

Funds available for road and bridge construction, 1917..	\$198,942.86
Expenditures for state aid road construction	86,111.83
Total state aid expenditures	86,111.83
Balance available for 1918 (after deducting advances of \$6,826.71)	11,004.32
Total appropriation for 1918 road and bridge construction	82,702.10
Amount available 1918	92,706.42

CRAWFORD COUNTY

This county continues to make only moderate progress. Due to the topography, work is very expensive and progress slow.

If this county is to anywhere near bring its roads up to the standard demanded by today's traffic, it will be necessary to bond the county for a considerable amount and go at the work aggressively as soon as the war and financial conditions permit.

Construction work in this county continues to be well done but has been more severely curtailed than in many of the other counties due to the lack of local sentiment. The maintenance of the State Trunk Highway System has been only fair, and it has been impossible to get some of the county officials to permit doing some of the absolutely necessary work to make certain sections passable.

CRAWFORD COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$934.60; Local, \$5,600.00; County, \$5,600.00; State, \$3,714.34; Other, \$27.65; Total	\$15,876.59
Mileage: Graded and surfaced, 1.33 miles; Graded not surfaced, 4.40 miles; Total, 5.73 miles; Approximate number roads built, 11	
Grading: 5.73 miles at \$1,876 per mile; 36,211 cu. yds. earth moved at 30 cts. per cu. yd.; average excavation per mile, 6,320 cu. yds.	10,750.88
Culverts: 17 conc. culverts; 2,535' cu. yds. conc. at \$7.00 per cu. yd.	1,776.17
Total cost per mile of all culverts, \$310	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Shale: 0.80 miles at \$1,230; 4,250 sq. yds. at 23 cts. ..	988.00
Nonpermanent types of surfacings: 0.53 miles at \$970 per mile	512.70
Miscellaneous Items:	
Right of way purchased	595.00
Clearing and grubbing	235.00
Ditching and draining	5.00
Riprap	48.00
Total cost per mile of all miscellaneous items, \$154	
Total expenditures for 1916 road construction	14,910.75
Balance carried forward	965.84

CRAWFORD COUNTY

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1915, \$251.34; Local, \$1,525.08; County, \$1,525.08; State, 1,011.56; Total	\$3, 810.38
Steel I-beam bridges: No. built, 4; total length, 108 ft.; containing 291.2 cu. yds. concrete; 34,980 lbs. steel; cost per ft., \$40.80	
Total No. bridges built, 4; Total length, 108 ft.; Total expenditures	4, 497.87
Deficit carried forward	597.49

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$965.84; Local, \$7,-600.00; County, \$7,600.00; State, \$4,397.55; Total ..	\$20, 563.39
Mileage: Graded and surfaced, 0.51 miles; Graded not surfaced, 1.75 miles; Total, 2.26 mils; Approximate number roads built, 4	
Grading: 2.26 miles at \$1,510 per mile; 10,159 cu. yds. earth moved at 35 cts. per cu. yd.; average excavation per mile, 4,500 cu. yds.	3, 503.22
Culverts: 4 conc. culverts; 47.5 cu. yds. conc. at \$12.10 per cu. yd.	575.00
Total cost per mile of all culverts, \$255	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 0.11 miles at \$830 per mile	182.00
Miscellaneous Items:	
Right of way purchased	250.00
Clearing and grubbing	11.64
Guard rail: 2,000 lin. ft. at 15 cts. per lin. ft.	471.00
Total cost per mile of all miscellaneous items, \$324	
Total expenditures for 1917 road construction	5, 587.86
Balance carried forward	14, 975.53

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$597.49; Local, \$1,603.76; County, \$1,603.76; State, \$927.98; Total	\$3, 538.01
Reinforced concrete slab and girder bridges: No. built, 2; Total length, 14 ft.; containing, 125.4 cu. yds. concrete; 6,590 lbs. steel; cost per ft., \$133.75; per cu. yd. \$14.95	
Total No. bridges built, 2; Total length, 14 ft.; total expenditures	1, 872.82
Balance carried forward	1, 665.19

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$24, 101.40
Expenditures for state aid road construction	5, 587.86
Expenditures for state aid bridge construction	1, 872.82
Total state aid expenditures	7, 460.68
Balance available for 1918	16, 640.72
Total appropriation for 1918 road and bridge construction	18, 897.94
Amount available 1918	\$35, 538.66

DANE COUNTY

Work in this county was very heavy in 1916, somewhat reduced in 1917, and very much cut down in 1918. Construction work has been good and the maintenance of its surfaced roads better than the average, but some trouble has been had in securing patrolmen in 1918, and the average state trunk highway maintenance has not been fully satisfactory on the earth roads although there are several excellently maintained sections.

Two changes in county highway commissioner within the period covered has not made for best results, although both of the new commissioners have done all that they could.

Dane County has a very serious highway problem and covers a tremendous area, needing a large and competent highway organization to properly do all the work which must be done. The county board should increase its supervisory force and the expenditures made fully justify a much larger supervision account.

The county officials are cooperating to their utmost within the limits fixed by the county board as to supervision, but the county board should give more attention to highway matters and realize more clearly the immensity of the county highway problem.

DANE COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$7,350.09; Local, \$60,-	
408.50; County, \$60,408.50; State, \$40,990.85; Other,	
\$6,910.73; Total	\$176,068.67
Net amount transferred to bridge fund	2,450.35
Net total available for bridge construction	173,618.32
Mileage: Graded and surfaced, 15.35 miles; Surfaced not	
graded, 8.55 miles; Graded not surfaced, 19.52 miles;	
Total, 43.42 miles; Approximate number roads built,	
65	
Grading: 34.87 miles at \$977 per mile; 109,700 cu. yds.	
earth moved at 32 cts. per cu. yd.; average excavation	
per mile, 3,150 cu. yds.	35,380.46
Culverts: 108 conc. culverts; 1,390 cu. yds. conc. at \$7.27	
per cu. yd.	10,606.32
2 culverts repaired	185.23
Total cost per mile of all culverts, \$309	
Surfacing: (Cost per mile given is based on 9 ft. width of	
surfacing)	
Crushed stone: 16.82 miles at \$2,970; 92,411 sq. yds. at	
56 cts.	53,297.52
Crushed gravel: 1.83 miles at \$2,400; 9,650 sq. yds. at	
45 cts.	4,381.56
Pit run gravel: 4.01 miles at \$1,430; 21,160 sq. yds. at	
27 cts.	6,250.19



FIG. 1. A resurfacing job on Trunk Highway No. 10, Dane County. Note the trench which has been formed by scarifying the surface and throwing the material out with the road grader.



FIG. 2. The same road as Figure 1, after the resurfacing was completed, and before being surface treated. Note the flat crown which is necessary where surface treatment is contemplated.



FIG. 3. A Cleveland Caterpillar Tractor pulling an ordinary Four-horse grader on an earth road on trunk highway No. 12, Dane County. It is surprising the ease with which the little tractor handled the grader on ordinary earth road patrol maintenance work.

DANE COUNTY

Concrete: 1.24 miles at \$6,900; 10,060 sq. yds. at \$1.30	\$27,317.29
Shoulders to concrete road	654.20
Miscellaneous Items:	
Right of way purchased	990.00
Clearing and grubbing	87.55
Tile underdrain	94.80
Guard rail: 8,272 lin. ft. at 22 cts. per l.n. ft.	1,819.39
Miscellaneous	40.75
Total cost per mile of all miscellaneous items, \$97	
Total expenditures for 1916 road construction	141,105.26
Balance	32,513.06
Paid to C., M. & St. P. R. R.	1,300.00
Balance carried forward	31,213.06

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$592.41; Local, \$4,490.00; County, \$4,490.00; State, \$3,046.75; Total	\$12,619.16
Net amount transferred from road fund	2,450.35
Net total available for bridge construction	15,069.51
Reinforced concrete slab and girder bridges: No. built, 7; Total length, 88 ft.; containing 439.9 cu. yds. concrete; 21,200 lbs. steel; cost per ft., \$54.75; per cu. yd., \$10.95	4,816.28
Steel I-beam bridges: No. built, 3; Total length, 82 ft.; containing 254 cu. yds. concrete; 34,020 lbs. steel; cost per ft., \$38.15	3,129.00
Steel truss bridges: No. built, 1; Total length, 40 ft.; containing 151.2 cu. yds. concrete; 18,960 lbs. steel; cost per ft. \$31.25	1,248.00
Substructures only: No. built, 1; containing 40.0 cu. yds.; Total cost	179.58
Total No. bridges built, 12; Total length, 210 ft.; Total expenditures	9,372.86
Balance carried forward	5,696.65

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$31,213.06; County, \$69,-144.54; State, \$46,096.36; Other, \$45,981.02; Total..	\$194,433.98
Net amount transferred to bridge fund	4,549.51
Net total available for road construction	189,884.47
Mileage: Graded and surfaced, 9.09 miles; Surfaced not graded, 3.31 miles; Graded not surfaced, 20.57 miles; Total, 32.91 miles; Approximate number roads built, 26	
Grading: 29.60 miles at \$1,200 per mile; 97,800 cu. yds. earth moved at 39 cts. per cu. yd.; average excavation per mile, \$3,300	38,386.88

DANE COUNTY

Culverts: 68 conc. culverts; 830 cu. yds. conc. at \$11.10 per cu. yd.	9,236.80
Total cost per mile of all culverts, \$310	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 5.29 miles at \$3,870; 35,516 sq. yds. at 74 cts.	45,598.56
Crushed gravel: 6.11 miles at \$2,540; 42,420 sq. yds. at 48 cts.	20,392.81
Pit run gravel: 0.53 miles at \$2,070; 2,800 sq. yds. at 39 cts.	1,095.57
Concrete: 0.11 miles; 4,332 sq. yds.	8,954.19
Miscellaneous Items:	
Right of way purchased	3,318.15
Clearing and grubbing	136.99
Tile underdrain	139.94
Guard rail: 2,112 lin. ft.	1,604.89
Total cost per mile of all miscellaneous items, \$175	
Total expenditures for 1917 road construction	128,864.78
Balance carried forward	61,019.69
1917 STATE AID BRIDGE CONSTRUCTION	
Funds Available: Balance 1916, \$5,696.65; Total	5,696.65
Net amount transferred from road fund	4,549.51
Net total available for bridge construction	\$10,246.16
Reinforced concrete slab and girder bridges: No. built, 10; Total length, 112 ft.; containing 523.7 cu. yds. concrete; 24,840 lbs. steel; cost per ft., \$75.00; per cu. yd., \$15.95	
Total No. bridges built, 10; Total length, 112 ft.; Total expenditures	8,396.43
Balance carried forward, \$1,849.73	1,849.73

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$200,130.63
Expenditures for state aid road construction	128,864.78
Expenditures for state aid bridge construction	8,396.43
Total state aid expenditures	137,261.21
Balance available for 1918	62,869.42
Total appropriation for 1918 road and bridge construction	108,365.77
Amount available 1918	171,235.19

DODGE COUNTY

This county has done remarkably well in the last few years. The appropriations have been large and the work extensive.

The present county highway commissioner is doing excellent construction and maintenance work, and the conduct of work in this county is in many ways a model for other counties to follow.

Very suspicious of the State Aid highway law in the beginning, the present overwhelming sentiment ruling in this county and the results secured are one of the most striking events in recent Wisconsin road history.

DODGE COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$15,788.28; Local, \$21,230.00; County, \$28,450.00; State, \$24,841.95;	
Other, \$915.26; Total	\$91,225.49
Net amount transferred from bridge fund	2,625.00
Net total available for road construction	93,850.49
Mileage: Graded and surfaced, 18.83 miles; Surfaced not graded, 1.27 miles; Graded not surfaced, 3.49 miles; Total, 23.59 miles; Approximate number roads built, 31	
Grading: 22.32 miles at \$613 per mile; 45,953 cu. yds. earth moved at 30 cts. per cu. yd.; average excavation per mile, 2,050 cu. yds.	14,312.81
Culverts: 61 conc. culverts; 601.7 cu yds. conc. at \$7.75 per cu. yd.	4,839.33
Total cost per mile of all culverts, \$209	
Surfacing. (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 8.51 miles at \$2,600; 50,938 sq. yds. at 52 cts.	27,849.34
Crushed gravel: 11.59 miles at 1,810; 62,835 sq. yds. at 34 cts.	21,530.68
Road oiling	702.00
Miscellaneous Items:	
Tile underdrain	277.21
Guard rail: 1,710 lin. ft. at 39 cts. per lin. ft.	672.05
Ditching and draining	46.00
Miscellaneous	609.41
Total cost per mile of all miscellaneous items, \$72	
Total expenditures for 1916 road construction	70,838.83
Balance carried forward	23,011.66
Returned to general fund	1.95
Balance carried forward	23,009.71

DODGE COUNTY

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$4,393.39; Total	\$4, 393.39
Net amount transferred to road fund	2, 625.09
Net total available for bridge construction	1, 768.39
Reinforced concrete slab and girder bridges: No. built 4; Total length, 34 ft.; containing 160.9 cu. yds. concrete; 7,250 lbs. steel; cost per ft., \$49.10; per cu. yd. \$10.35	1, 668.40
Steel I-beam bridges: No. built 1; Total length, 20 ft.; containing 113.1 cu. yds. concrete; 7,760 lbs. steel; cost per ft., \$51.50	1, 030.00
Total No. bridges built, 5; Total length, 54 ft.; Total expenditures	2, 698.40
Deficit carried forward	930.01

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$23,079.71; Local, \$31,950.00; County, \$31,950.00; State, \$23,727.97; Advanced, \$1,602.86; Other, \$377.26; Total	\$112. 617.80
Mileage: Graded and surfaced, 13.76 miles; Surfaced not graded, 3.04 miles; Graded not surfaced, 1.37 miles; Total, 18.17 miles; Approximate number roads built, 21	
Grading: 15.13 miles at \$594 per mile; 25,064 cu. yds. earth moved at 36 cts. per cu. yd.; average excavation per mile, 1,660 cu. yds.	9, 117.56
Culverts: 48 conc. culverts; 633.3 cu. yds. conc. at \$9.68 per cu. yd.	6, 197.41
2 culverts repaired	131.82
Total cost per mile of all culverts, \$405	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 3.99 miles at \$2,800; 23,385 sq. yds. at 53 cts.	19, 456.67
Crushed gravel: 12.64 miles at \$2,360; 66,748 sq. yds. at 45 cts.	31, 551.24
Pit run gravel: 0.17 miles at \$1,530; 920 sq. yds. at 28 cts.	260.46
Miscellaneous Items:	
Tile underdrain	970.52
Guard rail: 1,868 lin. ft. at 21 cts. per lin. ft.	385.68
Ditching and draining	25.00
Miscellaneous	57.74
Total cost per mile of all miscellaneous items, \$95	
Total expenditures for 1917 road construction	68, 154.10
Balance (after deducting advances)	42, 860.84
Returned to town of Trenton	174.50
Balance carried forward	42, 686.34

DODGE COUNTY

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$930.01; Local, \$2,380.00;	
County, \$2,380.00; State, \$1,767.59; Total	\$5, 597.49
Reinforced concrete slab and girder bridges: No. built, 3;	
Total length, 48 ft.; containing, 218.1 cu. yds. concrete;	
10,990 lbs. steel; cost per ft., \$76.00; per cu. yd., 16.70	3, 646.96
Steel I-beam bridges: No. built, 1; Total length, 30 ft.;	
containing 84.2 cu. yds. concrete; 15,210 lbs. steel;	
cost per ft., \$38.15	1, 144.00
Total No. bridges built, 4; total length, 78 ft.; total expenditures	4, 790.96
Balance carried forward	806.53

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$118, 040.79
Expenditures for state aid road construction	68, 154.10
Expenditures for state aid bridge construction	4, 790.96
Total state aid expenditures	72, 945.06
Balance available for 1918 (after deducting advances of 1, 602.86)	43, 492.87
Total appropriation for 1918 road and bridge construction	108, 514.53
Amount available 1918	152, 007.40

DOOR COUNTY

Door County has a very large mileage of limestone macadam roads. At one time it was a premier good roads county in Wisconsin and still holds a very high position. Much of the old macadam mileage became badly worn during a period of non-maintenance, extending over several years, but the county has been striving to bring these roads back into condition with fair results.

It will be necessary to make large maintenance expenditures to hold the roads which have been built under the heavy traffic which goes into this summer resort county.

On the whole the county board is doing moderately well with its problems, and sentiment is such that it can be expected that the county will maintain its position.

DOOR COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$5,218.45; Local, \$12,725.75; County, \$12,725.75; State, \$5,054.82; Other, \$42.87; Total	\$35,767.64
Mileage: Graded and surfaced, 12.33 miles; Surfaced not graded, 0.19 miles; Graded not surfaced, 2.86 miles; Total 15.38 miles; Approximate number roads built, 16	
Grading: 15.19 miles at \$850 per mile; 38,800 cu. yds. earth moved at 33 cts. per cu yd.; average excavation per mile, 2,550 cu. yds.	12,957.35
Culverts: 20 conc. culverts; 211.0 cu. yds. conc. at \$7.87 per cu. yd.	1,662.99
1 culvert repaired	5.50
Total cost per mile of all culverts, \$110	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 12.52 miles at \$1,706; 66,080 sq. yds. at 32 cts.	21,358.93
Miscellaneous Items:	
Total expenditures for 1916 road construction	35,984.77
Deficit carried forward	217.13

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$966.90; Local, \$1,400.00; County, \$1,400.00; State, \$556.08; Total..	\$4,322.98
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 18 ft.; containing 76.5 cu. yds. concrete; 4,120 lbs. steel; cost per ft., \$47.15; per cu. yd. \$11.10	849.00
Reinforced concrete arch bridges: No. built, 1; Total length, 10 ft.; containing 48.0 cu. yds. concrete; 1,540 lbs. steel; cost per ft., \$59.60; per cu yd., \$12.40	596.10
Total No. bridges built, 2; Total length, 28 ft.; Total expenditures	1,445.10
Balance carried forward	2,877.88

DOOR COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$217.13; Local, \$17,010.02; County, \$17,010.02; State, \$5,253.05; Total	\$39,055.96
Mileage: Graded and surfaced, 14.07 miles; Surfaced not graded, 0.51 miles; Graded not surfaced, 3.40 miles; Total 17.98 miles; Approximate number roads built, 22	
Grading: 17.47 miles at \$850 per mile; 34,163 cu. yds. earth moved at 43 cts. per cu. yd.; average excavation per mile, 1,950 cu. yds.	14,845.86
Culverts: 15 conc. culverts; 198.0 cu. yds. conc. at \$9.10 per cu. yd.	1,799.14
Total cost per mile of all culverts, \$103	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 14.58 miles at \$2,315; 76,958 sq. yds. at 44 cts.	34,249.92
Oil: 17,800 sq. yds. at \$2,408.89	
Miscellaneous Items:	
Guard rail: 295 lin. ft. at 48 cts. per lin. ft.	141.75
Total cost per mile of all miscellaneous items, \$8	
Total expenditures for 1917 road construction	53,445.56
Deficit carried forward	14,389.60

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$2,877.88; Local, \$1,050.00; County, \$1,050.00; State, \$324.27; Total..	\$5,302.15
Reinforced concrete slab and girder bridges: No. built, 7; Total length, 80 ft.; containing 344.9 cu. yds. concrete; 16,810 lbs. steel; cost per ft.; \$50.50; per cu. yd., \$1.70	
Total No. bridges built, 7; Total length, 80 ft.; Total expenditures	4,040.90
Balance carried forward	1,261.25

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$44,358.11
Expenditures for state aid road construction	53,445.56
Expenditures for state aid bridge construction	4,040.90
Total state aid expenditures	57,486.46
Deficit for 1918	13,128.35
Total appropriation for 1918 road and bridge construction	52,324.91
Amount available 1918	39,196.56

DOUGLAS COUNTY

Conditions in this county remain fairly satisfactory. The construction and maintenance are good. Difficulties from the heavy soil and lack of surfacing materials have been hard to meet.

Some division of sentiment on the county board as to methods has delayed ultimate results, but there is plenty of good roads sentiment in this county, the county board is intelligent and energetic, and the county may be depended upon to finally work out its difficult road problem with success.

DOUGLAS COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$12,697.51; Local, \$500.00; County, \$66,500.00; State, \$17,372.55, Other, \$33,874.77; Total	\$130,944.83
Net amount transferred to bridge fund	12,628.72
Net total available for road construction	118,316.11
Mileage: Graded and surfaced, 5.22 miles; Surfaced not graded, 1.76 miles; Graded not surfaced, 27.38 miles; Total, 34.36 miles; Approximate number roads built	
Grading: 32.60 miles at \$1.255 per mile; 130,121 cu. yds. earth moved at 34 cts. per cu. yd.; average excavation per mile, 4,000 cu. yds.	43,738.59
Culverts: 105 conc. culverts; 1,285.0 cu. yds. conc. at \$12.34 per cu. yd.	15,843.40
5 culverts repaired	222.71
Total cost per mile of all culverts, \$493	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 2.25 miles at \$470 per mile	1,338.48
Crushed stone: 0.76 miles at \$2,570; 4,000 sq. yds. at 49 cts.	1,954.79
Crushed gravel: 3.97 miles at \$1,975; 26,682 sq. yds. at 37 cts.	10,064.36
Miscellaneous Items:	
Right of way purchased	1,015.66
Clearing and grubbing	309.29
Inspection	2,413.70
Stone gutters	1,285.68
Guard rail: 3,402 lin. ft. at 17 cts. per lin. ft.	572.22
Ditching and draining	1,180.60
Riprap	639.60
Miscellaneous items	948.15
Total cost per mile of all miscellaneous items, \$256	
Total expenditures for 1916 road construction	81,527.23
Balance	36,788.88
Cost of maintenance and county administration.....	24,023.73
Balance carried forward	12,765.15

DOUGLAS COUNTY**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available. Balance 1915, \$85.68; Total	\$85.68
Net amount transferred from road fund	12, 628.72
Net total available for bridge construction	12, 714.40
Reinforced concrete slab and girder bridges: No. built, 6; Total length, 84 ft.; containing, 378.8 cu. yds. concrete; 19,659 lbs. steel; cost per ft., \$57.00; per cu. yd., \$12.65	4, 787.92
Steel I-beam bridges: No. built, 1; Total length, 38 ft.; containing 45.8 cu. yds. concrete; 18,020 lbs. steel; cost per ft., \$13.15	500.00
Steel truss bridges: No. built, 3; Total length, 185 ft.; containing 376.1 cu. yds. concrete; 94,860 lbs. steel; cost per ft., \$39.65	7, 340.80
Total No. bridges built, 10; Total length, 307 ft.; total expenditures	12, 628.72
Balance carried forward	85.68

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$12,765.15; County, \$56,117.04; State, \$14,674.96; Other, \$13,986.11; Total	\$97, 543.26
Mileage: Graded and surfaced, 2.88 miles; Surfaced not graded, 3.05 miles; Graded not surfaced, 16.53 miles; Total 22.46 miles; Approximate number roads built, 20	
Grading: 19.41 miles at \$1,686 per mile; 84,167 cu. yds. earth moved at 39 cts. per cu. yd.; average excavation per mile, 4,330 cu. yds.	33, 962.00
Culverts: 44 conc. culverts; 472.2 cu. yds. conc. at \$19.70 per cu. yd.	6, 458.24
1 culvert repaired	144.62
Total cost per mile of all culverts, \$340	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 2.22 miles	1, 492.24
Pit run gravel: 3.71 miles at \$2,090; 19,580 sq. yds. at 40 cts.	14, 831.26
Miscellaneous Items:	
Right of way purchased	2.10
Guard rail: 5,922 lin. ft. at 20.8 cts. per lin. ft.	1, 234.76
Ditching and draining	142.80
Miscellaneous	3, 630.26
Total cost per mile of all miscellaneous items, \$258	
Total expenditures for 1917 road construction	61, 898.28
Balance carried forward	35, 644.98

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$85.68; County, \$14,400.00; State, \$3,600.00; Total	\$18, 085.68
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 114 ft.; containing, 509.8 cu. yds. concrete; 37,130 lbs. steel; cost per ft., \$83.10; per cu. yd., \$18.60	



FIG. 1. A view on Trunk Highway No. 10, Douglas County, between Superior and Iron River. The soil is sticky, heavy red clay, and at the time the picture was taken the surface was in ideal condition, due principally to the persistent use of the road planer by the patrolman.



FIG. 2. A view showing the diversion of a stream and the necessary bank protection in Eau Claire County.



FIG. 3. A stone wagon used quite generally, especially throughout northern Wisconsin. Note that it is hung very low, making the work of handling the loose stone found along the road much easier. This type of wagon can be used to very great advantage for many purposes.

DOUGLAS COUNTY

Total No. bridges built, 4; Total length, 114 ft.; total expenditures	\$9,478.53
Balance carried forward	8,607.15

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1918..	\$115,628.94
Expenditures for state aid road construction	61,898.28
Expenditures for state aid bridge construction	9,478.53
Total state aid expenditures	71,376.81
Balance available for 1918	44,252.13
Total appropriation for 1918 road and bridge construction	49,964.84
Amount available 1918	94,216.97

DUNN COUNTY

General conditions in this county have improved. The present county highway commissioner has better support and is getting much better results than any of his predecessors. The work is handicapped by lack of surfacing materials and moderate appropriations and practically no county machinery, but the county is making encouraging progress. The maintenance of the State Trunk Highway System has been very good.

DUNN COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$8,609.61; Local, \$8,600.00; County, \$8,600.00; State, \$6,771.22; Total	\$32,580.83
Net amount transferred from bridge fund	720.86
Net total available for road construction	33,301.69
Mileage: Graded and surfaced, 7.31 miles; Surfaced not graded, 0.96 miles; Graded not surfaced, 2.63 miles; Total 10.90 miles; Approximate number roads built, 18	
Grading: 9.94 miles at \$783 per mile; 32,744 cu. yds. earth moved at 24 cts. per cu. yd.; average excavation per mile, 3,300 cu. yds.	7,785.09
Culverts: 30 conc. culverts; 295.5 cu. yds. conc. at \$7.20 per cu. yd.	2,117.13
1 culvert repaired	34.47
Total cost per mile of all culverts, \$216	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 8.27 miles at \$1,116; 47,409 sq. yds. at 21 cts.	10,021.54
Miscellaneous Items:	
Guard rail: 2,271 lin. ft. at 25 cts. per lin. ft.	567.45
Miscellaneous	374.85
Total cost per mile of all miscellaneous items, \$94	
Total expenditures for 1916 road construction	20,900.03
Balance carried forward	12,401.66



FIG. 1. This view is one of two dangerous railroad grade crossings on Trunk Highway No. 12 between Menomonie and Knapp, Dunn Co. A relocation of less than one-half mile eliminated both grade crossings with practically no grading work required, except road machine work. The purchase of approximately two acres of land was necessary. The railroad company paid one-half the cost of the relocation.



FIG. 2. The point where the relocation leaves the old road (East end of relocation). Note the house at the extreme left side of the view. It was necessary to cut the farm buildings off from the balance of the farm in order to locate the road properly.



FIG. 3. Where the relocation returns to the old road, looking east, showing the railroad crossing to the left and the farm buildings in the distance.

DUNN COUNTY.**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1915, \$6,185.50; Local, \$1,460.00; County, \$1,460.00; State, \$1,149.53; Total	\$10, 255.03
Net amount transferred to road fund	720.86
Net total available for bridge construction	9, 534.17
Steel I-beam bridges: No. built, 6; Total length, 130 ft.; containing 474.0 cu. yds. concrete; 56,040 lbs. steel; cost per ft., \$47.90	
Total No. bridges built, 6; Total length, 130 ft.; Total expenditures	6,229.69
Balance carried forward	3, 304.48

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$12,401.66; Local, \$9,600; County, \$9,600.00; State, \$7,313.79; Other, \$1,918.23; Total	\$40, 833.68
Net amount transferred from bridge fund	754.01
Net total available for road construction	41, 587.69
Mileage: Graded and surfaced, 10.39 miles; Surfaced not graded, 1.55 miles; Graded not surfaced, 2.76 miles; Total, 14.70 miles; Approximate number roads built, 27	
Grading: 13.15 miles at \$900 per mile; 40,188 cu. yds. earth moved at 29 cts., per cu. yd.; average excavation per mile, 3,050 cu. yds.	11, 815.74
Culverts: 26 conc. culverts; 308.5 cu. yds. conc. at \$9.30 per cu. yd.	2, 869.57
4 metal culverts, \$292.45	
Total cost per mile of all culverts, \$240	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 0.88 miles at \$976 per mile	859.15
Pit run gravel: 11.06 miles at \$1,132; 64,752 sq. yds. at 21 cts.	13, 814.62
Miscellaneous Items:	
Right of way purchased	200.00
Guard rail: 4,160 lin. ft. at 27 cts. per lin. ft.	1, 143.73
Ditching and draining	93.93
Miscellaneous	305.88
Total cost per mile of all miscellaneous items, \$133	
Total expenditures for 1917 road construction	31, 395.07
Payments on road construction of preceding years ...	6, 517.19
Total road disbursements 1917	37, 912.26
Balance carried forward	3, 675.43

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$3,304.48; Local \$1,928.00; County, \$1,928.00; State, \$1,468.85; Total	\$8, 629.33
Net amount transferred to road fund	754.01
Net total available for bridge construction	7, 875.32
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 42 ft.; containing 195.7 cu. yds. concrete; 9,940 lbs. steel; cost per ft., \$67.75; per cu. yd., \$14.55	2, 844.65



FIG. 1. A diversion dam constructed in 1915 near Colfax, Dunn County, to prevent the destruction of a state highway by the Red Cedar River. Extreme high floods cause some water to go over the dam and down the old channel, but the main volume of water is turned down the new channel to the right.



FIG. 2. A view on Trunk Highway No. 12, Dunn County, looking east from the west side of Elk Creek.



FIG. 3. A view on Trunk Highway No. 12, Village of Knapp, Dunn County, showing a well maintained 15 ft. gravel road built in 1917.

DUNN COUNTY

Steel truss bridges: No. built, 1; Total length, 45 ft.; containing 107.6 cu. yds. concrete; 19,880 lbs. steel; cost per ft., \$40.60	\$1,817.00
Total No. bridges built, 4; Total length, 87 ft.; Total expenditures	4,661.65
Balance carried forward	3,213.67

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction 1917 ..	\$49,463.01
Expenditures for state aid road construction	37,912.26
Expenditures for state aid bridge construction	4,661.65
Total state aid expenditures	42,573.91
Balance available for 1918	6,889.10
Total appropriation for 1918 road and bridge construction	37,546.80
Amount available 1918	44,435.40

EAU CLAIRE COUNTY

This county started very slowly under the State Aid law, but after the first two years has developed very rapidly and sentiment in the county is now excellent. The construction work has been good, maintenance fair to good.

As soon as conditions resume the normal this county will undoubtedly bond for a considerable amount to complete its main highways.

In general conditions may be considered to be good, and constantly improving.

EAU CLAIRE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$583.36; County, \$29,399.30; State, \$8,690.70; Other, \$745.00; Total..	\$39,328.36
Mileage: Graded and surfaced, 11.63 miles; Graded not surfaced, 1.18 miles; Total 12.81 miles; Approximate number roads built, 14	
Grading: 12.81 miles at \$827 per mile; 43,454 cu. yds. earth moved at 24 cts. per cu. yd.; average excavation per mile, 3,390 cu. yds.	10,598.10
Culverts: 37 conc. culverts; 465.5 cu. yds. conc. at \$8.46 per cu. yd.	3,942.27
3 culverts repaired	139.84
Total cost per mile of all culverts, \$319	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 1.17 miles at \$1,175 per mile	1,377.60
Pit run gravel: 4.32 miles at \$1,565; 26,899 sq. yds. at 30 cts.	7,961.22

EAU CLAIRE COUNTY

Concrete: 1.03 miles at \$6,570; 6,222 sq. yds at \$1.25..	\$7,755.23
Shale: 5.11 miles at \$1,118; 27,067 sq. yds. at 21 cts...	5,731.68
Shoulders to concrete road	477.50
Miscellaneous Items:	
Right of way purchased	85.00
Clearing and grubbing	186.52
Tile underdrain	28.80
Guard rail: 5,681 lin. ft. at 24 cts. per lin. ft.	1,358.66
Ditching and draining	33.10
Miscellaneous	129.50
Total cost per mile of all miscellaneous items, \$142	
Total expenditures for 1916 road construction	39,805.02
Deficit carried forward	476.66

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$1,613.00; Total	\$1,613.00
Steel plate girder bridges: No. built, 1; Total length, 60 ft., containing 199.4 cu. yds. concrete; 32,860 lbs. steel; cost per ft., \$54.50	
Total No. bridges built, 1; Total length, 60 ft.; total expenditures	3,271.00
Deficit carried forward	1,658.00

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$476.66; County, \$40,506.14; State, \$8,493.86; Other, \$500.90; Total..	\$49,023.34
Net amount transferred to bridge fund	1,428.13
Net total available for road construction	47,595.21
Mileage: Graded and surfaced, 9.57 miles; Surfaced not graded, 0.10 miles; Graded not surfaced, 0.47 miles; Total 10.14 miles; Approximate number roads built 14	
Grading: 10.94 miles at \$918 per mile; 51,000 cu. yds. earth moved at 29 cts. per cu. yd.; average excavation per mile, 5,080 cu. yds.	14,564.97
Culverts: 15 conc. culverts; 185.9 cu. yds. conc. at \$10.60 per cu. yd.	1,969.63
Total cost per mile of all culverts, \$196	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 1.17 miles at \$1,213 per mile	1,418.42
Pit run gravel: 7.06 miles at \$1,515; 38,985 sq. yds. at 29 cts.	12,072.02
Concrete: 1.44 miles at \$8,100; 7,627 sq. yds. at \$1.53..	11,699.42
Shoulders to concrete road	2,828.50
Miscellaneous Items:	
Right of way purchased	465.00
Clearing and grubbing	260.85
Tile underdrain	306.56
Guard rail: 3,720 lin. ft. at 26 cts. per lin. ft.	987.74
Miscellaneous	288.40
Total cost per mile of all miscellaneous items, \$230	
Total expenditures for 1917 road construction	46,361.51
Balance carried forward	1,233.70

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$1,658.00; County, \$2,-704.00; State, \$567.00; Total	\$1, 613.00
Net amount transferred from road fund	1, 428.13
Net total available for bridge construction	3, 041.13
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 20 ft.; containing 77.3 cu. yds. concrete; 4,370 lbs. steel; cost per ft., \$71.30; per cu. yd., \$18.45	
Total No. bridges built, 1; Total length, 20 ft.; Total expenditures	1, 425.65
Balance carried forward	1, 615.48

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$50, 636.34
Expenditures for state aid road construction	46, 361.51
Expenditures for state aid bridge construction	1, 425.65
Total state aid expenditures	47, 787.16
Balance available for 1918	2, 849.18
Total appropriation for 1918 road and bridge construction	21, 725.35
Amount available 1918	24, 574.53

FLORENCE COUNTY

Some years ago this county undertook and completed a remarkable road program considering its valuation. In the past biennium very small further progress has been made, the county devoting itself to maintaining the roads which had been built and to rather small extensions. Construction work in this county is good and the maintenance very good. All in all, the county is holding its own.

FLORENCE COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$3,047.38; County, \$3,000.00; State, \$1,513.35; Total	\$7, 560.73
Mileage: Graded and surfaced, .70 miles; Surfaced not graded, 2.00 miles; Graded not surfaced, 1.63 miles; Total, 4.33 miles	
Grading: 2.33 miles	1, 653.18
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 0.70 miles	631.43
Iron ore: 2.00 miles	2, 383.69
Miscellaneous Items:	
Clearing and grubbing	280.00
Total cost per mile of all miscellaneous items, \$120	
Total expenditures for 1916 road construction	4, 948.30
Balance carried forward	2, 612.43

FLORENCE COUNTY

NO 1916 STATE AID BRIDGE CONSTRUCTION

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$2,612.43; County, \$3,000.00; State, \$1,528.21; Other, \$551.91; Total..	\$7,692.55
Mileage: Graded and surfaced, 0.99 miles; Graded not surfaced, 2.26 miles; Total, 3.25 miles; Approximate number roads built, 5	
Grading: 3.25 miles at \$1,377 per mile; 20,000 cu. yds. earth moved at 29 cts.; per cu. yd.; average excavation per mile, 4,820 cu. yds.	5,641.00
Culverts: 2 conc. culverts; 22.8 cu. yds. conc. at \$11.00 per cu. yd.	250.00
Total cost per mile of all culverts, \$77	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed gravel: 0.23 miles at \$2,430; 1,200 sq. yds. at 47 cts.	564.20
Pit run gravel: 0.76 miles at \$1,000; 4,000 sq. yds. at 19 cts.	760.82
Miscellaneous Items:	
Clearing and grubbing	802.03
Total cost per mile of all miscellaneous items, \$810	
Total expenditures for 1917 road construction	8,018.05
Deficit	325.50
Held on 1916 contracts	1,595.43
Net balance carried forward	1,269.93

NO 1917 STATE AID BRIDGE CONSTRUCTION

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1918..	\$9,287.98
Expenditures for state aid road construction	8,018.05
Total state aid expenditures	8,018.05
Deficit for 1918	1,269.93
Total appropriation for 1918 road and bridge construction	4,687.60
Amount available 1918	5,957.53

FOND DU LAC COUNTY

Work in this county continues up to the former standard, construction being good and maintenance (up to 1918) up to standard. Difficulties with the new county highway commissioner, resulting in his suspension and resignation have very much handicapped the work in 1918.

Due to the very heavy travel on all of its main roads it will be necessary for this county to abandon the construction of stone and macadam roads and build either concrete, brick or gravel and to wider widths than have heretofore been used. The county board may be expected to meet this problem in an adequate way as conditions and sentiment in the county in general are excellent.

FOND DU LAC COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$4,458.77; County, \$40,000.00; State, \$20,859.45; Other, \$1,206.48;	
Total	\$66,524.70
Net amount transferred to bridge fund	750.00
Net total available for road construction	65,774.70
Mileage: Graded and surfaced, 7.78 miles; Graded not surfaced, 2.16 miles; Total, 9.94 miles; Approximate number roads built, 8	
Grading: 9.94 miles at \$1,160 per mile; 20,636 cu. yds. earth moved at 56 cts. per cu. yd. average excavation per mile, 2,070 cu. yds.	11,532.48
Culverts: 54 conc. culverts; 579.8 cu. yds. conc at \$8.56 per cu. yd.	4,960.02
2 culverts repaired	146.23
Total cost per mile of all culverts, \$514	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 7.78 miles at \$3,850; 41,115 sq. yds. at 73 cts.	31,570.15
Miscellaneous Items:	
Clearing and grubbing	555.53
Tile underdrain	249.04
Ditching and draining	281.52
Miscellaneous	826.33
Total cost per mile of all miscellaneous items, \$192	
Total expenditures for 1916 road construction	50,121.25
Balance carried forward	15,653.45

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$574.82; Total	\$574.82
Net amount transferred from road fund	750.00
Net total available for bridge construction	1,324.82
Reinforced concrete slab and girder bridges: No. built, 6; Total length, 113 ft.; containing 579.2 cu. yds. concrete; 29,750 lbs. steel; cost per ft., \$75.30; per cu. yd., \$14.70	
Total No. bridges built, 6; Total length, 113 ft.; Total expenditures	8,510.69
Deficit carried forward	7,185.87

FOND DU LAC COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$15,653.45; County, \$41,- 626.73; State, \$18,070.26; Other, \$422.30; Total....	\$75, 772.74
Net amount transferred to bridge fund	1, 121.15
Net total available for road construction	74, 651.59
Mileage: Graded and surfaced, 7.44 miles; Surfaced not graded, 0.25 miles; Graded not surfaced, 0.32 miles; Total, 8.01 miles; Approximate number roads built, 7	
Grading: 7.76 miles at \$1,368 per mile; 18,680 cu. yds. earth moved at 58 cts. per cu. yd.; average excava- tion per mile, 2,400 cu. yds.	10, 824.41
Culverts: 28 conc. culverts; 263.7 cu. yds. conc. at \$9.07 per cu. yd.	2, 392.18
4 culverts repaired	805.86
Total cost per mile of all culverts, \$347	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 4.45 miles at \$4,690; 24,500 sq. yds. at 85 cts.	21, 386.01
Crushed gravel: 3.24 miles at \$2,590; 17,100 sq. yds. at 49 cts.	8, 394.72
Miscellaneous Items:	
Clearing and grubbing	333.34
Guard rail: 808 lin. ft. at 44 cts. per lin. ft.	322.36
Miscellaneous	321.81
Total cost per mile of all miscellaneous items, \$126	
Total expenditures for 1917 road construction	44, 280.69
Balance carried forward	30, 370.90

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$7,185.87; Local, \$3,- 373.29; County, \$3,373.27; State, \$3,373.27; Total..	\$2, 933.96
Net amount transferred from road fund	1, 121.15
Net total available for bridge construction	4, 055.11
Reinforced concrete slab and girder bridges; No. built, 2; Total length, 26 ft.; containing 84.0 cu. yds. concrete; 4,060 lbs. steel; cost per ft., \$43.80; per cu. yd., \$13.55	
Total No. bridges built, 2; Total length, 26 ft.; Total ex- penditures	1, 135.61
Balance carried forward	2, 919.50

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$78, 706.70
Expenditures for state aid road construction	44, 280.69
Expenditures for state aid bridge construction	1, 135.61
Total state aid expenditures	45, 416.30
Balance available for 1918	33, 290.40
Total appropriation for 1918 road and bridge construc- tion	54, 112.54
Amount available 1918	87, 402.94

FOREST COUNTY

Work in this county both as to construction and maintenance is remarkably successful. Appropriations both by direct taxation and bond issues have been extremely heavy and the main roads of Forest County have been put in excellent condition.

No criticism can be made of the construction, maintenance or general sentiment in this county.

FOREST COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Deficit 1915, \$7,462.59; Local, \$18,-	
650.00; County, \$18,650.00; State, \$3,410.10; Ad-	
vanced, \$6,500.00; Other, \$2,627.19; Bonds, \$18,-	
300.00; Total	\$60,674.70
Net amount transferred to bridge fund	28.65
Net total available for road construction	60,646.05
Mileage: Graded not surfaced, 15.17 miles; Total, 15.17	
miles; Approximate number roads built, 16	
Grading: 15.17 miles at \$1,643 per mile; 67,919 cu. yds.	
earth moved at 36 cts. per cu. yd., average excava-	
tion per mile, 4,480 cu. yds.	32,240.70
Culverts: 17 conc. culverts; 260.3 cu. yds. conc. at \$9.75	
per cu. yd.	2,532.69
6 metal culverts: 1 culvert repaired	657.58
Total cost per mile of all culverts, \$210	
Miscellaneous Items:	
Clearing and grubbing	8,457.68
Tile underdrain	94.76
Guard rail	42.06
Ditching and draining	283.34
Miscellaneous	1,125.08
Total cost per mile of all miscellaneous items, \$660	
Total expenditures for 1916 road construction	45,433.89
Balance carried forward (after deducting advances) ..	8,712.16

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1915, \$275.09; Local, \$970.00;	
County, \$970.00; State, \$129.90; Total	\$1,794.81
Net amount transferred from road fund	28.65
Net total available for bridge construction	1,823.46
Reinforced concrete slab and girder bridges: No. built, 3;	
Total length, 54 ft.; containing 217.9 cu. yds. con-	
crete; 11,940 lbs. steel; cost per ft., \$36.50; per cu.	
yd., \$9.05	
Total No. bridges built, 3; Total length, 54 ft.; Total ex-	
penditures	1,970.65
Deficit carried forward	147.19



FIG. 1. A view in Forest County showing what the road builder is up against in northern Wisconsin.



FIG. 2. A grading outfit in Forest County operating a Maney Wheeler. Ordinarily a tractor is used to assist in loading the wheelers, but at the time this view was taken the tractor was temporarily out of commission. It required four extra horses to do the work of the tractor.



FIG. 3. An interesting view along Trunk Highway No. 14 in Forest County. Note the Trunk Highway marker stencilled on the rock, which is one of the many methods resorted to in marking the State Trunk System.

FOREST COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$8,712.16; Local, \$38,- 070.10; County, \$10,057.88; State, \$3,794.09; Other, \$1,603.57; Bonds, \$76,500.00; Total	\$138,737.80
Net amount transferred to bridge fund	5,969.06
Net total available for road construction	132,768.74
Mileage: Graded and not surfaced, 21.54 miles; Total, 21.86 miles; Approximate number roads built, 13	
Grading: 21.86 miles at \$1,968 per mile; 108,280 cu. yds. earth moved at 40 cts. per cu. yd.; average excava- tion per mile, 4,950 cu. yds.	34,500.81
Culverts: 41 conc. culverts; 226.6 cu. yds. conc. at \$8.32 per cu. yd.	1,885.20
20 metal culverts	1,945.95
Total cost per mile of all culverts, \$175	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings	361.50
Pit run gravel: 0.32 miles at \$2,070; 2,125 sq. yds. at 39 cts.	836.00
Miscellaneous Items:	
Right of way purchased	261.54
Clearing and grubbing	16,624.78
Tile underdrain	1,522.58
Ditching and draining	1,269.47
Miscellaneous	8,647.80
Total cost per mile of all miscellaneous items, \$1,295	
Total expenditures for 1917 road construction	67,855.63
Balance	64,913.11
Returned to local units	14,000.00
Balance carried forward	50,913.11

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$147.19; Local, \$4,- 900.00; County, \$276.12; State, \$104.00; Total	\$5,132.93
Net amount transferred from road fund	5,969.06
Net total available for bridge construction	11,101.99
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 130 ft.; containing 518.8 cu. yds. con- crete; 28,970 lbs. steel; cost per ft., \$62.25; per cu. yd., \$15.60	
Total No. bridges built, 4; Total length, 130 ft.; Total ex- penditures	8,092.60
Balance carried forward	3,009.39

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$129,870.73
Expenditures for state aid road construction	67,855.63
Expenditures for state aid bridge construction	8,092.60
Total state aid expenditures	75,948.23
Balance available for 1918	53,922.50
Total appropriation for 1918 road and bridge construc- tion	30,773.42
Amount available 1918	84,695.92

GRANT COUNTY

Work in this county continues good and maintenance in general is good. Due to the topography, improvements are very costly, many tremendous hills being encountered in the work.

The county commissioner and the county board are meeting the difficult situation as well as could be expected, and further developments in the way of larger appropriations and more concentrated work may be expected.

GRANT COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$14,086.21; Local, \$26,139.29; County, \$26,139.29; State, \$16,357.44;	
Advanced, \$9,303.49; Other, \$1,420; Total	\$93,445.72
Net amount transferred from bridge fund	1,560.98
Net total available for road construction	95,006.70
Mileage: Graded and surfaced, 6.29 miles; Surfaced not Graded, 2.16 miles; Graded not surfaced, 10.35 miles; Total 18.80 miles; Approximate number roads built, 34	
Grading: 16.64 miles at \$1,553 per mile; 105,000 cu. yds. earth moved at 37 cts. per cu. yd.; average excavation per mile, 6,329 cu. yds.	
	38,577.81
Culverts: 72 conc. culverts; 1000.0 cu. yds. conc. at \$8.00 per cu. yd.	
	7,016.41
4 culverts repaired	
	183.93
Total cost per mile of all culverts, \$432	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 6.02 miles at \$3,250; 31,803 sq. yds. at 61 cts.	
	19,462.94
Crushed gravel: 2.43 miles at \$2,850; 12,830 sq. yds. at 54 cts.	
	6,938.14
Miscellaneous Items:	
Right of way purchased	4,695.15
Clearing and grubbing	478.50
Tile underdrain	183.70
Guard rail: 8,044 lin. ft. at 22 cts. per lin. ft.	2,159.82
Ditching and draining	27.50
Riprap	389.80
Miscellaneous	946.79
Total cost per mile of all miscellaneous items, \$534	
Total expenditures for 1916 road construction.....	81,060.49
Balance carried forward	4,642.72

GRANT COUNTY**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1915, \$4,913.03; Local, \$2,- 400.00; County, \$2,400.00; State, \$1,501.86; Total...	\$11,214.89
Net amount transferred to road fund	1,560.98
Net total available for bridge construction	9,653.91
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 55 ft.; containing 264.6 cu. yds. concrete; 12,740 lbs. steel; cost per ft., \$41.70; per cu. yd., \$8.65	2,293.72
Steel truss bridges: No. built, 1; Total length, 120 ft.; containing 264.4 cu. yds. concrete; 81,230 lbs. steel; cost per ft., \$51.80;	6,218.62
Steel plate girder bridges: No. built, 2; Total length, 125 ft., containing 186.6 cu. yds. concrete; 71,070 lbs. steel; cost per ft. \$39.25;	4,904.19
Total No. bridges built, 7; Total length, 300 ft.; Total expenditures	13,416.53
Deficit carried forward	3,762.62

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$4,642.72; Local, \$31,- 066.35; County, \$31,066.35; State, \$16,413.15; Other, \$4,187.93; Total	\$87,376.50
Net amount transferred from bridge fund	4,937.11
Net total available for road construction	92,313.61
Mileage: Graded and surfaced, 2.24 miles; Surfaced not graded, 1.08 miles; Graded not surfaced, 12.62 miles; Total, 15.94 miles; Approximate number roads built, 36	
Grading: 14.86 miles at \$1,921 per mile; 112,300 cu. yds. earth moved at 36 cts. per cu. yd.; average excavation per mile, 7,550 cu. yds.	40,131.97
Culverts: 71 conc. culverts; 941.3 cu. yds. conc. at \$11.25 per cu. yd.	10,606.62
3 culverts repaired	238.60
Total cost per mile of all culverts, \$73	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 2.22 miles at \$3,360; 13,631 sq. yds. at 64 cts.	14,002.40
Crushed gravel: 1.05 miles at \$2,290; 5,822 sq. yds. at 43 cts.	2,520.32
Concrete: 0.05 miles at —; 240 sq. yds. at \$1.09	261.11
Road oil	693.85
Miscellaneous Items:	
Right of way purchased	1,958.65
Clearing and grubbing	349.50
Tile underdrain	233.80
Guard rail: 10,605 lin. ft. at 29 cts per lin. ft.	3,111.62
Ditching and draining	100.00

GRANT COUNTY

Riprap	\$451.97
Miscellaneous	1,201.47
Total cost per mile of all miscellaneous items, \$498	
Total expenditures for 1917 road construction	75,861.88
Balance	16,451.73
Returned to local units	187.29
Balance carried forward	16,264.44

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$3,762.62; Local, \$5,- 616.65; County, \$5,616.65; State, \$2,967.60; Total...	\$10,438.28
Net amount transferred to road fund	4,937.11
Net total available for bridge construction	5,501.17
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 36 ft.; containing 171.5 cu. yds. con- crete; 8,760 lbs. steel; cost per ft., \$68.25; per cu. yd., \$14.30	
Total No. bridges built, 3; Total length, 36 ft.; Total ex- penditures	2,453.55
Balance carried forward	3,047.62

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$97,627.49
Expenditures for state aid road construction	75,861.88
Expenditures for state aid bridge construction	2,453.55
Total state aid expenditures	78,315.43
Balance available for 1918	19,312.06
Total appropriation for 1918 road and bridge construc- tion	46,322.76
Amount available 1918	65,634.82

GREEN COUNTY

Work in this county continues but on a somewhat reduced scale. Due to the very large mileage of stone roads constructed in the past the maintenance problem is very heavy and expensive. Very large expenditures are necessary to keep the old roads in condition for travel and these have not been fully provided for.

Due to the very heavy narrow tired milk traffic the county will have to take up the construction of concrete or brick roads if the situation is to be met. With the resumption of normal conditions this county, being an overwhelmingly good roads county, will attack its new problems in the proper manner. Just now all is being done that can reasonably be done to meet very difficult conditions.

GREEN COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$35,026.14; Local, \$31,-	
979.30; County, \$31,979.30; State, \$12,323.23; Ad-	
vanced, \$16,846.68; Other, \$751.40; Total	\$128,906.05
Mileage: Graded and surfaced, 10.41 miles; Surfaced not	
graded, 2.94 miles; Graded not surfaced: 6.66 miles;	
Total, 20.01 miles; Approximate number roads built,	
35	
Grading: 17.07 miles at \$1,700 per mile; 60,000 cu. yds.	
earth moved at 50 cts. per cu. yd.; average excava-	
tion per mile, 3,510 cu. yds.	30,103.86
Culverts: 35 conc. culverts; 416.0 cu. yds. conc. at \$9.58	
per cu. yd.	3,989.32
Total cost per mile of all culverts, \$234	
Surfacing: (Cost per mile given is based on 9 ft. width of	
surfacing)	
Crushed stone: 6.39 miles at \$2,460; 33,770 sq. yds. at	
46 cts.	16,712.25
Crushed gravel: 5.80 miles at \$2,200; 30,630 sq. yds. at	
41 cts.	13,001.31
Concrete: 1.16 miles at \$8,080; 8,885 sq. yds. at \$1.53..	13,618.59
Road oil	334.38
Miscellaneous Items:	
Right of way purchased	389.00
Miscellaneous	5,594.41
Total cost per mile of all miscellaneous items, \$347	
Total expenditures for 1916 road construction	83,692.62
Balance (after deducting advances)	28,366.75
Returned to joint fund (county board disallowed	
a part of the 1914 fund in town of Monroe)	7,377.45
Balance carried forward	20,989.30

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$6,283.82; Local, \$4,-422.00; County, \$4,422.00; State, \$1,704.02; Total...	\$16,831.84
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 33 ft.; containing 199.6 cu. yds. concrete; 8,660 lbs. steel; cost per ft., \$51.60; per cu. yd., \$9.85	1,961.49
Steel I-beam bridges: No. built, 3; Total length, 80 ft.; containing 411.0 cu. yds. concrete; 36,190 lbs. steel; cost per ft., \$48.25	3,858.00
Steel truss bridges: No. built, 1; Total length, 100 ft.; containing 169.1 cu. yds. concrete; 68,630 lbs. steel; cost per ft., \$35.25	3,523.00
Total No. bridges built, 7; Total length, 218 ft.; Total expenditures	9,342.49
Balance carried forward	7,489.35

GREEN COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$20,989.30; Local, \$28,-100.00; County, \$32,600.00; State, \$13,212.45; Other, \$26.60; Total	\$94,923.35
Net amount transferred from bridge fund	1,687.52
Net total available for road construction	96,615.87
Mileage: Graded and surfaced, 8.41 miles; Surfaced not graded, 0.16 miles; Graded not surfaced, 2.93 miles; Total, 11.50 miles; Approximate number roads built, 21	
Grading: 11.34 miles at \$1,624 per mile; 36,600 cu. yds. earth moved at 50 cts. per cu. yd.; average excavation per mile, 3,220 cu. yds.	18,456.42
Culverts: 33 conc. culverts; 389.2 cu. yds. conc. at \$12.00 per cu. yd.	4,664.86
Total cost per mile of all culverts, \$410	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 4.97 miles at \$3,210; 26,490 sq. yds. at 61 cts.	16,104.88
Crushed gravel: 2.52 miles at \$4,060; 14,653 sq. yds. at 77 cts.	11,299.68
Concrete: 1.08 miles at \$10,900; 7,005 sq. yds. at \$2.06	14,464.72
Oil application	920.91
Miscellaneous Items:	
Right of way purchased	1,135.90
Clearing and grubbing	256.15
Tile underdrain	84.00
Guard rail: 1,897 lin. ft. at 29 cts. per lin. ft.	608.80
Riprap	50.00
Total cost per mile of all miscellaneous items, \$188	
Total expenditures for 1917 road construction	68,045.82
Balance carried forward	28,570.05

GREEN COUNTY**1917 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1916, \$7,489.35; Local, \$3,- 172.78; County, \$3,172.78; State, \$1,153.08; Total...	\$14,987.99
Net amount transferred to road fund	1,687.52
Net total available for bridge construction	13,300.47
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 80 ft.; containing 359.4 cu. yds. concrete; 22,560 lbs. steel; cost per ft., \$91.75; per cu. yd., \$20.40	
Total No. bridges built, 3; Total length, 80 ft.; Total expenditures	7,335.71
Balance carried forward	5,964.76

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$109,916.34
Expenditures for state aid road construction	68,045.82
Expenditures for state aid bridge construction	7,335.71
Total state aid expenditures	75,381.53
Balance available for 1918	34,534.81
Total appropriation for 1918 road and bridge construction	84,580.43
Amount available 1918	119,115.24

GREEN LAKE COUNTY

This county continues to do a small amount of construction which in general is well done, and the maintenance has been good.

Considering its soil and wealth the county is doing as well as could be expected under present war conditions.

GREEN LAKE COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$2,836.73; Local, \$5,- 984.00; County, \$7,786.60; State, \$6,885.30; Other, \$1,485.71; Total	\$24,978.34
Mileage: Graded and surfaced 5.12 miles; Surfaced not graded, 0.31 miles; Graded not surfaced, 0.51 miles; Total, 5.94 miles; Approximate number roads built, 8	
Grading: 5.63 miles at \$642 per mile; 13,793 cu. yds. earth moved at 26 cts. per cu. yd.; average excavation per mile, 2,450 cu. yds.	3,613.76
Culverts: 11 conc. culverts; 136.0 cu. yds. conc. at \$6.00 per cu. yd.	899.52
3 culverts repaired	329.78
Total cost per mile of all culverts, \$218	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 4.73 miles at \$2,760; 27,733 sq. yds. at 52 cts.	15,433.81
Pit run gravel: 0.70 miles at \$1,300; 3,700 sq. yds. at 24 cts.	910.94

GREEN LAKE COUNTY

Miscellaneous Items:

Clearing and grubbing	\$25.90
Miscellaneous	163.28
Total cost per mile of all miscellaneous items, \$33	
Total expenditures for 1916 road construction	21, 876.99
Balance carried forward	3, 601.85

NO 1916 STATE AID BRIDGE CONSTRUCTION

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$3,601.85; Local, \$8,- 134.00; County, \$8,134.00; State, \$7,190.88; Ad- vanced, \$800.00; Other, \$152.39; Total	\$28, 012.62
Mileage: Graded and surfaced 5.38 miles; Surfaced not graded, 0.34 miles; Graded not surfaced, 0.23 miles; Total, 5.95 miles; Approximate number roads built, 10	
Grading: 5.61 miles at \$661 per mile; 12,795 cu. yds. earth moved at 29 cts. per cu. yd.; average excava- tion per mile, 2,280 cu. yds.	3, 713.87
Culverts: 14 conc. culverts; 159.9 cu. yds. conc. at \$7.81 per cu. yd.	1, 249.83
1 culvert repaired	41.20
Total cost per mile of all culverts, \$280	
Surfacing: (Cost per mile given is based on 9'ft. width of surfacing)	
Crushed stone: 4.87 miles at \$2,910 ; 26,510 sq. yds. at 55 cts.	14, 614.32
Pit run gravel: 0.85 miles at \$1,930; 4,500 sq. yds. at 36 cts.	1, 642.68
Miscellaneous Items:	
Clearing and grubbing	29.50
Miscellaneous	286.98
Total cost per mile of all miscellaneous items, \$56	
Total expenditures for 1917 road construction	21, 578.38
Balance (after deducting advances)	5, 634.24
Returned to local units	834.00
Balance carried forward	4, 800.24

NO 1917 STATE AID BRIDGE CONSTRUCTION

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$27, 178.62
Expenditures for state aid road construction	21, 578.38
Total state aid expenditures	21, 578.38
Balance available for 1918 (after deducting advances of \$800.00)	4, 800.24
Total appropriation for 1918 road and bridge construc- tion	21, 866.98
Amount available 1918	26, 667.22

IOWA COUNTY

Considerable advance has been made in this county in the biennium. Construction has not been large considering its valuation, but many effective improvements have been made and the work in general has been well done.

The maintenance, both of the State Trunk Highway System and the County Trunk System in 1918, has been good and represents a distinct advance over the previous condition of the county's main roads.

In general, conditions in this county are encouraging and local road sentiment is developing.

IOWA COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Deficit 1915, \$193.59; Local, \$11,-400.00; County, \$11,400.00; State, \$11,991.75; Advanced, \$4,758.25; Other, \$78.15; Total	\$39,434.56
Net amount transferred from bridge fund	575.00
Net. total available for road construction	40,009.56
Mileage: Graded and surfaced, 3.18 miles; Surfaced not graded, 0.34 miles; Graded not surfaced, 4.20 miles; Total, 7.72 miles; approximate number roads built, 16	
Grading: 7.38 miles at \$1,435 per mile; 29,000 cu. yds. earth moved at 36 cts. per cu. yd.; average excavation per mile, 3,930 cu. yds.	10,594.79
Culverts: 30 conc. culverts; 388.0 cu. yds. conc. at \$9.62 per cu. yd.	4,165.52
Total cost per mile of all culverts, \$564	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 1.36 miles at \$676 per mile	919.45
Crushed stone: 1.88 miles at \$3,580; 11,552 sq. yds. at 68 cts.	6,441.57
Shale: 0.28 miles at \$865; 1,500 sq. yds. at 16 cts.	242.50
Miscellaneous Items:	
Right of way purchased	1,681.56
Clearing and grubbing	257.18
Tile underdrain	42.00
Guard rail: 2,486 lin. ft. at 26 cts. per lin. ft.	656.43
Riprap	20.65
Miscellaneous	31.63
Total cost per mile of all miscellaneous items, \$365	
Total expenditures for 1916 road construction	25,053.28
Balance carried forward (after deducting advances) ..	10,198.03

IOWA COUNTY

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$1,191.52; Total	\$1, 191.52
Net amount transferred to road fund	575.00
Net total available for bridge construction	616.52
Steel I-beam bridges: No. built, 1; Total length 32 ft.; containing 129.4 cu. yds. concrete; 14,760 lbs. steel; cost per ft., \$37.50	
Total No. bridges built, 1; Total length, 32 ft.; Total ex- penditures	1, 198.71
Deficit carried forward	582.19

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$10,198.03; Local, \$13,- 236.50; County, \$13,236.50; State, \$12,121.37; Other, \$1,018.66; Total	\$49, 811.06
Net amount transferred to bridge fund	497.02
Net total available for road construction	50, 308.08
Mileage: Graded and surfaced, 2.21 miles; Surfaced not graded, 1.15 miles; Graded not surfaced, 2.51 miles; Total, 5.87 miles; Approximate number roads built, 12	
Grading: 4.72 miles at \$1,583 per mile; 15,875 cu. yds. earth moved at 42 cts. per cu. yd.; average excava- tion per mile, 3,360 cu. yds.	8, 474.02
Culverts: 25 conc. culverts; 395.3 cu. yds. conc. at \$10.90 per cu. yd.	4, 437.16
Total cost per mile of all culverts, \$94	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 1.84 miles at \$741 per mile	1, 363.50
Crushed stone: 1.52 miles at \$4,900; 9,269 sq. yds. at 93 cts.	8, 059.09
Miscellaneous Items:	
Right of way purchased	1, 742.00
Clearing and grubbing	95.15
Guard rail: 1,595 lin. ft. at 24 cts. per lin. ft	388.42
Riprap	8.00
Miscellaneous	65.61
Total cost per mile of all miscellaneous items, \$487	
Total expenditures for 1917 road construction	24, 632.95
Balance	25, 675.13
Returned to village	164.45
Balance carried forward	25, 510.68

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$582.19; Local, \$1,- 000.00; County, \$1,000.00; State, \$958.61; Total....	\$2, 376.42
Net amount transferred to road fund	497.02
Net total available for bridge construction	1, 879.40
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 4 ft.; containing 63.0 cu. yds. concrete; 2,080 lbs. steel; cost per ft., \$181.15; per cu. yd. \$11.60	
Total No. bridges built, 1; Total length, 4 ft.; Total ex- penditures	724.50
Balance carried forward	1, 154.90

IOWA COUNTY**STATEMENT JANUARY 1, 1918**

Funds available for road and bridge construction, 1917	\$52,023.03
Expenditures for state aid road construction	24,632.95
Expenditures for state aid bridge construction	724.50
Total state aid expenditures	25,357.45
Balance available for 1918	26,665.58
Total appropriation for 1918 road and bridge construction	31,416.62
Amount available 1918	58,082.20

IRON COUNTY

This county has done well organized and consistent work for the past several years. Its main road from Manitowish through Hurley to Cedar has been constructed, and also the main road from Hurley to Plummer. Construction is good but the maintenance was disappointing in 1918. This county will well meet its road situation as it develops.

IRON COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$1,836.23; Local, \$5,-500.00; County, \$26,500.00; State, \$2,416.20; Other, \$19,179.81; Total	\$55,432.24
Mileage: Graded and surfaced, 3.46 miles; Graded not surfaced, 8.79 miles; Total, 12.25 miles; Approximate number roads built, 3	
Grading: 12.25 miles at \$2,155 per mile; 35,420 cu. yds. earth moved at 75 cts. per cu. yd.; average excavation per mile, 2,890 cu. yds.	26,410.47
Culverts: 42 metal culverts	4,959.47
Total cost per mile of all culverts, \$405	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Iron ore: 3.46 miles at \$1,172; 19,778 sq. yds. at 22 cts.	4,384.13
Miscellaneous Items: ..	
Clearing and grubbing	2,172.41
Miscellaneous	856.12
Total cost per mile of all miscellaneous items, \$247	
Total expenditures for 1916 road construction	38,782.60
Balance carried forward	16,649.64

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$7,888.00; Local, \$734.40; County, \$734.40; State, \$734.40; Total	\$10,091.20
Steel truss bridges: No. built, 1; Total length, 70 ft.; containing 106.3 cu. yds. concrete; 37,930 lbs. steel; cost per ft., \$29.90	
Total No. bridges built, 1; Total length, 70 ft.; Total expenditures	2,092.65
Balance carried forward	7,998.55

IRON COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$16,649.64; Local, \$2,000.00; County, \$23,943.00; State, \$3,379.63;	
Total	\$45,972.27
Mileage: Graded and surfaced 1.74 miles; Surfaced not graded, 1.34 miles; Graded not surfaced, 8.12 miles; Total, 11.20 miles; Approximate number roads built, 7	
Grading: 9.86 miles at \$2,320 per mile; 31,080 cu. yds. earth moved at 44 cts. per cu. yd.; average excavation per mile, 3,220 cu. yds.	23,006.52
Culverts: 14 conc. culverts; 150.2 cu. yds. conc. at \$14.65 per cu. yd.	2,201.69
Total cost per mile of all culverts, \$271	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 1.74 miles at \$1,260; 9,200 sq. yds. at 24 cts.	2,194.05
Iron ore: 1.34 miles at \$1,124; 7,100 sq. yds. at 21 cts..	1,507.05
Miscellaneous Items:	
Clearing and grubbing	1,259.87
Total cost per mile of all miscellaneous items, \$127	
Total expenditures for 1917 road construction	30,169.18
Balance	15,803.09
Returned to maintenance fund	62.34
Balance carried forward	15,740.75

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$7,998.55; Total	\$7,998.55
Balance carried forward	7,998.55

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917.	\$53,908.48
Expenditures for state aid road construction	30,169.18
Total state aid expenditures	30,169.18
Balance available for 1918	23,739.30
Total appropriation for 1918 road and bridge construction	21,897.51
Amount available 1918	45,636.81

JACKSON COUNTY

Conditions in this county for a long time unsatisfactory, have been improved. The county board seems to have taken a new grip on affairs and is attacking the road problem much more energetically. Construction has been fair to good, varying with the man directly in charge, and the maintenance this year has been fair considering difficult conditions in the county.

On the whole with the change in sentiment on the part of the county board, and the change in county highway commissioners, it is felt that this county is on the road to meeting its road problem much more adequately than in the past.

JACKSON COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$13,419.66; Local, \$10,184.90; County, \$10,184.00; State, \$4,699.67; Advanced, \$2,200.00; Other, \$438.81; Total	\$41,126.14
Mileage: Graded and surfaced, 8.56 miles; Surfaced not graded, 2.46 miles; Graded not surfaced, 6.92 miles; Total, 17.94 miles; Approximate number roads built, 34	
Grading: 15.48 miles at \$606 per mile; 49,100 cu. yds. earth moved at 19 cts. per cu. yd.; average excavation per mile, 3,170 cu. yds	9,378.94
Culverts: 41 conc. culverts; 489.8 cu. yds. conc. at \$10.12 per cu. yd.	4,955.81
Total cost per mile of all culverts, \$320	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 5.83 miles at \$699 per mile	4,223.24
Shale: 5.19 miles at \$905; 27,674 sq. yds at 17 cts.	4,747.40
Miscellaneous Items:	
Right of way purchased	812.80
Clearing and grubbing	185.20
Guard rail: 1,140 lin. ft. at 21 cts. per lin. ft.	236.81
Ditching and draining	78.95
Total cost per mile of all miscellaneous items, \$85	
Total expenditures for 1916 road construction	24,619.15
Balance (after deducting advances)	14,306.99
Payments made on 1915 contracts reported in 1915...	2,338.83
Balance carried forward	11,968.16

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$4,069.74; Local, \$1,150.00; County, \$1,150.00; State, 530.68; Total ..	\$6,900.42
Steel I-beam bridges: No. built, 3; Total length, 44 ft.; containing 263.7 cu. yds. concrete; 13,180 lbs. steel; cost per ft., \$44.00	
Total No. bridges built, 3; Total length, 44 ft.; total expenditures	1,936.55
Balance carried forward	4,963.87

JACKSON COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$11,968.16; Local, \$13,500; County, \$13,500; State, \$4,467.32; Other, \$210.95; Total	\$43, 646.43
Net amount transferred from bridge fund	530.22
Net total available for road construction	44, 176.65
Mileage: Graded and surfaced, 3.76 miles; Surfaced not graded, 3.33 miles; Graded not surfaced, 5.75 miles; Total, 12.84 miles; Approximate number roads built, 31	
Grading: 9.51 miles at \$760 per mile; 30,150 cu. yds. earth moved at 23 cts. per cu. yd.; average excavation per mile, 3,469 cu. yds.	7, 780.44
Culverts: 24 conc. culverts; 286.2 cu. yds. conc. at \$8.40 per cu. yd.	3, 830.74
Total cost per mile of all culverts, \$420	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 284 miles at \$843 per mile	2, 391.58
Concrete: 0.01 miles	1, 328.50
Shale: 4.24 miles at \$1,090; 22,880 sq. yds. at 21 cts. . .	5, 074.56
Miscellaneous Items:	
Right of way purchased	1, 810.00
Clearing and grubbing	119.60
Guard rail: 2,786 lin. ft. at 29 cts. per lin. ft.	937.41
Miscellaneous	101.85
Total cost per mile of all miscellaneous items, \$310	
Total expenditures for 1917 road construction	23, 374.18
Balance carried forward	20, 802.47

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$4,963.87; Local, \$2,900.00; County, \$2,900.00; State, \$959.65; Total..	\$11, 723.52
Net amount transferred to road fund	530.22
Net total available for bridge construction	11, 193.30
Reinforced concrete slab and girder bridges: No. built 2; Total length, 88 ft.; containing 472.4 cu. yds. concrete; 20,470 lbs. steel; cost per ft., \$65.75; per cu. yd., \$12.25	5, 782.72
Reinforced concrete arch bridges: No. built, 1; Total length, 35 ft.; containing 187.0 cu. yds. concrete; 11,890 lbs. steel; cost per ft., \$71.00; per cu. yd., \$13.30	2, 483.90
Steel I-beam bridges: No. built, 1; Total length, 18 ft.; containing 88.1 cu. yds. concrete; 5,119 lbs. steel; cost per ft., \$67.80	1, 220.00
Total No. bridges built, 4; Total length, 141 ft.; total expenditures	9, 486.62
Balance carried forward	1, 706.68

JACKSON COUNTY**STATEMENT JANUARY 1, 1918**

Funds available for road and bridge construction, 1917..	\$55,369.95
Expenditures for state aid road construction	23,374.18
Expenditures for state aid bridge construction	9,486.62
Total state aid expenditures	32,860.80
Balance available for 1918	22,509.15
Total appropriation for 1918 road and bridge construction	36,118.13
Amount available 1918	58,627.28

JEFFERSON COUNTY

This county has a very difficult road problem in that it started early and has a large mileage of macadam and gravel roads, not well maintained for many years and now needing extensive repairs. Construction has in general been good, maintenance poor to good, varying very much in various sections of the county.

The fact that one of the main roads in the state passes along the north county border, largely in the county, has made it difficult to obtain the required construction or maintenance on this road, the southern part of the county not taking any interest in it. This condition has been partly met by the State Trunk Highway act but not fully and the improvements designed for this road this year were not financed by the county board and thus postponed a year, and the maintenance on this section has not been up to standard, making difficult one of the keystones of the State Trunk Highway System.

However, conditions are not bad in the county and the situation will probably be met if the northern part of the county is more insistent upon its rights.

JEFFERSON COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$21,741.95; Local, \$20,133.00; County, \$20,133.00; State, \$15,337.30; Advanced, \$7,130.62; Other, \$458.97; Total	\$84,934.84
Mileage: Graded and surfaced, 10.93 miles; Surfaced not graded, 1.16 miles; Graded not surfaced, 5.02 miles; Total, 17.11 miles; approximate number roads built, 21	
Grading: 15.95 miles at \$1.282 per mile; 54,000 cu. yds. earth moved at 38 cts. per cu. yd.; average excavation per mile, 3,350 cu. yds.	20,430.74
Culverts: 30 conc. culverts; 360.0 cu. yds. conc. at \$6.70 per cu. yd.	2,408.20
Total cost per mile of all culverts, \$150	

JEFFERSON COUNTY

Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)

Nonpermanent types of surfacings; 3.04 miles at \$1,745 per mile	\$6,995.26
Crushed stone: 0.64 miles at	3,084.49
Pit run gravel: 7.42 miles at \$1,520; 53,265 sq. yds. at 29 cts.	19,996.18
Concrete: 0.99 miles at \$7,570; 9,306 sq. yds. at \$1.43	13,345.18
Shoulders to concrete road	600.30
Miscellaneous Items:	
Right of way purchased	670.62
Guard rail	514.38
Miscellaneous	1,810.01
Total cost per mile of all miscellaneous items, \$188	
Total expenditures for 1916 road construction	69,855.36
Balance carried forward (after deducting advances)..	7,948.86

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$3,235.09; Local, \$2,-114.00; County, \$2,114.00; State, \$1,610.45; Total...	\$9,073.54
Reinforced concrete slab and girder bridges: No. built, 5; Total length, 68 ft.; containing 320.6 cu. yds. concrete; 17,310 lbs. steel; cost per ft., \$55.80; per cu. yd., \$11.85	3,793.00
Reinforced concrete arch bridges: No. built, 1; Total length, 45 ft.; containing 340.0 cu. yds. concrete; 13,100 lbs. steel; cost per ft., \$96.50; per cu. yd., \$12.75	4,341.00
Total No. bridges built, 6; Total length, 113 ft.; Total expenditures	8,134.00
Balance carried forward	939.54

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$7,948.86; Local, \$21,-964.00; County, \$21,964.00; State, \$16,161.16; Advanced, \$13,646.08; Total	\$81,684.10
Net amount transferred from bridge fund	922.42
Net total available for road construction	82,606.52
Mileage: Graded and surfaced, 11.19 miles; surfaced not graded, 1.16 miles; Graded not surfaced, 1.10 miles; Total, 13.45 miles; Approximate number roads built, 17	
Grading: 12.29 miles at \$945 per mile; 38,000 cu. yds. earth moved at 52 cts. per cu. yd.; average excavation per mile, 3,100 cu. yds.	19,799.77
Culverts: 30 conc. culverts; 288.5 cu. yds. conc. at \$10.30 per cu. yd.	3,599.04
1 metal culvert	11.95
Total cost per mile of all culverts, \$293	

JEFFERSON COUNTY

Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.59 miles at \$2,000; 5,100 sq. yds. at 38 cts.	\$1,925.13
Pit run gravel: 11.76 miles at \$1,750; 65,315 sq. yds. at 33 cts.	\$0,777.53
Miscellaneous Items:	
Clearing and grubbing	\$59.98
Tile underdrain	\$58.97
Total cost per mile of all miscellaneous items, \$58	
Total expenditures for 1917 road construction	\$6,832.37
Balance carried forward (after deducting advances) ..	\$2,128.07

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$939.54; Local, \$1,-341.24; County, \$1,341.24; State, \$986.48; Total		\$4,608.50
Net amount transferred to road fund		\$22.42
Net total available for bridge construction		\$3,686.08
Reinforced concrete slab and girder bridges: No. built, 2;		
Total length, 16 ft.; containing 84.6 cu. yds. concrete; 3,820 lbs. steel; cost per ft., \$85.15; per cu. yd., \$16.10		
Total No. bridges built, 2; Total length, 16 ft.; Total expenditures		\$1,363.00
Balance carried forward		\$2,323.08

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$86,292.60
Expenditures for state aid road construction	\$6,832.37
Expenditures for state aid bridge construction	\$1,363.00
Total state aid expenditures	\$8,195.37
Balance available for 1918 (after deducting advances of \$13,646.08)	\$14,451.15
Total appropriation for 1918 road and bridge construction	\$89,951.26
Amount available 1918	\$104,402.41

JUNEAU COUNTY

Conditions in this county continue to be good. Construction, while limited, is good, and the maintenance of the macadam roads excellent and other maintenance fairly good.

All things considered Juneau County is doing all that could be expected.

JUNEAU COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$5,794.40; Local, \$16,521.39; County, \$16,723.09; State, \$4,732.45; Advanced, \$15,432.16; Other, \$3,362.78; Total	\$50,977.47
Net amount transferred from bridge fund	1,143.22
Net total available for road construction	52,120.69
Mileage: Graded and surfaced, 889 miles; Surfaced not graded, 1.94 miles; Graded not surfaced, 6.86 miles; Total 17.69 miles; Approximate number roads built, 30	
Grading: 15.75 miles at \$710 per mile; 39,295 cu. yds. earth moved at 28 cts. per cu. yd.; average excavation per mile 2,490 cu. yds.	11,194.73
Culverts: 25 conc. culverts; 276.3 cu. yds. conc. at \$10.52 per cu. yd.	2,907.58
Total cost per mile of all culverts, \$184	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 3.89 miles at \$1,130 per mile	4,392.62
Crushed stone: 6.90 miles at \$3,445; 36,911 sq. yds. at 65 cts.	24,879.28
Concrete: 0.04 miles at \$8,330; 358 sq. yds. at \$1.58...	728.83
Miscellaneous Items:	
Clearing and grubbing	322.72
Guard rail: 1,062 lin. ft. at 12 cts. per lin. ft.	248.57
Ditching and draining	681.80
Riprap	1,803.28
Miscellaneous	38.66
Total cost per mile of all miscellaneous items, \$196	
Total expenditures for 1916 road construction.....	47,197.57
Deficit carried forward (after deducting advances)....	10,509.04

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$15.34; Local, \$1,800.00; County, \$1,800.00; State, \$515.60; Total	\$4,130.94
Net amount transferred to road fund	1,143.22
Net total available for bridge construction	2,987.72
Reinforced concrete slab and girder bridges: No. built 4; Total length, 42 ft.; containing, 238.5 cu. yds. concrete; 10,910 lbs. steel; cost per ft., \$88.60; per cu. yd., \$15.60	3,718.62

JUNEAU COUNTY

Steel I-beam bridges: No. built, 1; Total length, 30 ft.; containing 119.4 cu. yds. concrete; 13,870 lbs. steel; cost per ft., \$89.50	\$2,459.00
Steel plate girder bridges: No. built, 2; Total length, 90 ft.; containing 222.7 cu. yds. concrete; 41,580 lbs. steel; cost per ft., \$69.10	6,220.78
Total No. bridges built, 7; Total length, 162 ft.; total expenditures	12,398.38
Deficit carried forward	9,410.66

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$10,509.04; Local, \$19,390.96; County, \$19,390.96; State, \$4,249.73; Advanced, \$3,667.77; Other, \$1,092.00; Total	\$37,282.38
Mileage: Graded and surfaced, 5.78 miles; Surfaced not graded, 1.77 miles; Graded not surfaced, 4.10 miles; Total 11.65 miles; Approximate number roads built, 25	
Grading: 9.88 miles at \$925 per mile; 33,200 cu. yds. earth moved at 31 cts. per cu. yd.; average excavation per mile, 3,360 cu. yds.	10,424.03
Culverts: 18 conc. culverts; 244.9 cu. yds. conc. at \$14.15 per cu. yd.	3,184.95
Total cost per mile of all culverts, \$222	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 3.77 miles at \$928 per mile	3,497.72
Crushed stone: 3.69 miles at \$3,860; 19,463 sq. yds. at 73 cts.	14,552.70
Concrete: 0.09 miles at \$9,700; 639 sq. yds. at \$1.84 ...	1,174.51
Miscellaneous Items:	
Right of way purchased	75.00
Clearing and grubbing	459.64
File underdrain	518.98
Guard rail: 1,324 lin. ft. at 16 cts. per lin. ft.	206.83
Ditching and draining	88.55
Miscellaneous	99.67
Total cost per mile of all miscellaneous items, \$146	
Total expenditures for 1917 road construction	34,282.58
Deficit (after deducting advances)	667.97
Returned to local units	1,000.00
Deficit carried forward	1,667.97

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$9,410.66; Local, \$5,350.00; County, \$5,350.00; State, \$1,172.55; Total	\$2,461.89
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 16 ft.; containing, 68.6 cu. yds. concrete; 3,540 lbs. steel; cost per ft., \$75.90; per cu. yd. \$17.70	1,213.05
Total No. bridges built, 1; Total length, 16 ft.; total expenditures	1,213.05
Balance carried forward	1,248.84



FIG. 1. The main street on the Military Reservation at Camp Douglas. About two miles of this type of road was built on the reservation in 1917, the top three inches being bonded with Tarvia "B" by the cold penetration method. The road is giving excellent satisfaction.



FIG. 2. A continuation of the road shown in Fig. 1 at a time when the water covered a considerable portion of its surface. At the point shown the water washed away the shoulders of the road leaving the stone surface intact and did no particular damage to the surface.



FIG. 3. A view of the Keegan Hill, Juneau County, construction. The work consisted of reducing the grade from approximately 18% to 10% by

JUNEAU COUNTY

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$38,744.27
Expenditures for state aid road construction	84,282.58
Expenditures for state aid bridge construction	1,213.05
Total state aid expenditures	35,495.63
Deficit for 1918 (after deducting advances of \$3,667.77)	419.13
Total appropriation for 1918 road and bridge construction	45,715.66
Amount available 1918	45,296.53

KENOSHA COUNTY

Work in this county has been good. A large mileage of excellent concrete road has been built.

Local road sentiment is excellent and further developments may be expected within the next few years.

There is probably no county in which the impetus of the State Aid Law has brought about greater local changes in road conditions than in Kenosha County.

KENOSHA COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$24,767.30; Local, \$25,-	
084.00; County, \$25,084.00; State, \$14,351.83; Ad-	
vanced, \$26,296.41; Other, \$546.39; Total	\$66,595.33
Net amount transferred from bridge fund	38.50
Net total available for road construction	66,633.83
Mileage: Graded and surfaced, 4.96 miles; surfaced not	
graded, 1.10 miles; Graded not surfaced, 4.33 miles;	
Total, 10.39 miles; Approximate number roads built,	
12	
Grading: 9.29 miles at \$950 per mile; 21,759 cu. yds.	
earth moved at 41 cts. per cu. yd.; average excava-	
tion per mile, 2,340 cu. yds.	9,728.26
Culverts: 23 conc. culverts; 229.8 cu. yds. conc. at \$9.42	
per cu. yd.	2,293.57
1 culvert repaired	35.00
Total cost per mile of all culverts, \$230	
Surfacing: (Cost per mile given is based on 9 ft. width of	
surfacing)	
Crushed stone: 1.96 miles at \$4,660; 10,340 sq. yds. at	
88 cts.	9,130.99
Crushed gravel: 2.70 miles at \$2,057; 14,270 sq. yds. at	
39 cts.	5,554.55
Concrete: 1.40 miles at \$6,630; 12,301 sq. yds. at \$1.25	30,310.46
Shoulders to concrete road	1,651.36

KENOSHA COUNTY

Miscellaneous Items:

Right of way purchased	\$20.00
Clearing and grubbing	126.56
Guard rail: 1,368 lin. ft. at 24 cts. per lin. ft.	357.42
Miscellaneous	55.00
Total cost per mile of all miscellaneous items, \$60	
Total expenditures for 1916 road construction	59,263.17
Deficit carried forward (after deducting advances) ...	18,925.75

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$101.06; Local, \$500.00;	
County, \$500.00; State, \$286.07; Total	\$1,387.13
Net amount transferred to road fund	38.50
Net total available for bridge construction	1,348.63
Reinforced concrete slab and girder bridges; No. built, 5;	
Total length, 64 ft.; containing 251.6 cu. yds. concrete; 12,000 lbs. steel; cost per ft., \$51.90; per cu. yd., \$13.20	3,319.00
Total No. bridges built, 5; Total length, 64 ft.; Total expenditures	3,319.00
Deficit carried forward	1,970.37

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$18,925.75; Local, \$21,489.31; County, \$21,489.31; State, \$14,922.13; Advanced, \$10,000.00; Other, \$468.67; Bonds, \$120,000; Total	\$169,443.67
Net amount transferred to bridge fund	38.50
Net total available for road construction	169,405.17
Mileage: Graded and surfaced, 8.59 miles; Surfaced not graded, 2.33 miles; Graded not surfaced, 2.33 miles; Total, 13.75 miles; Approximate number roads built, 12	
Grading: 10.92 miles at \$1,022 per mile; 20,618 cu. yds. earth moved at 54 cts. per cu. yd.; average excavation per mile, 1,890 cu. yds.	11,629.17
Culverts: 35 conc. culverts; 419.3 cu. yds. conc. at \$10.46 per cu. yd.	4,388.24
Total cost per mile of all culverts, \$403	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.47 miles at \$4,890; 2,500 sq. yds. at 92 cts.	2,299.64
Crushed gravel: 1.60 miles; 8,400 sq. yds. (incomplete)	9,719.08
Pit run gravel: 4.45 miles at \$1,080; 23,480 sq. yds. at 21 cts.	4,791.56
Concrete: 4.90 miles; 37,096 sq. yds. (incomplete)....	38,221.13
Shoulders to concrete road	1,498.78
Miscellaneous Items:	
Guard rail: 160 lin. ft. at 25 cts. per lin. ft.	40.00
Total cost per mile of all miscellaneous items, \$17	
Total expenditures for 1917 road construction	72,587.60
Balance carried forward (after deducting advances) ..	86,817.57

KENOSHA COUNTY

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit, 1916, \$1,970.37; Local, \$805.00;	
County, \$805.00; State, \$559.67; Total	\$199.30
Net amount transferred from road fund	38.50
Net total available for bridge construction	237.80
Balance carried forward	237.80

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$169,642.97
Expenditures for state aid road construction	72,587.60
Total state aid expenditures	72,587.60
Balance available for 1918 (after deducting advances of \$10,000.00)	87,055.37
Total appropriation for 1918 road and bridge construction	68,716.73
Amount available 1918	155,772.10

KEWAUNEE COUNTY

This county has gone ahead consistently but not as rapidly as the average county. Construction work is good and the maintenance excellent.

The county is doing well and will rapidly develop.

KEWAUNEE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$5,108.13; Local, \$5,- 700.00; County, \$5,700.00; State, \$4,680.00; Total...	\$10,971.87
Mileage: Graded and surfaced, 4.47 miles; Surfaced not graded, 2.10 miles; Total, 6.57 miles; Approximate number roads built, 8	
Grading: 4.47 miles at \$1,378 per mile; 21,300 cu. yds. earth moved at 29 cts. per cu. yd., average excavation per mile, 4,760 cu. yds.	6,187.54
Culverts: 30 conc. culverts; 324.3 cu. yds. conc. at \$7.65 per cu. yd.	2,480.17
Total cost per mile of all culverts, \$556	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 1.50 miles at \$2,000; 7,920 sq. yds. at 38 cts.	2,496.51
Pit run gravel: 5.07 miles at \$1,218; 26,780 sq. yds. at 23 cts.	6,138.30



FIG. 1. A view near Necedah, Juneau County, on State Trunk Highway No. 21, Petenwell Peak in the background. This is a 9 ft. limestone macadam road of which Juneau County has a great many miles and has succeeded in maintaining them very adequately. The bridge being built over the Wisconsin River described on page 15 is just behind the Peak.



FIG. 2. A patrolman at work on a gravel road in Kewaunee County, Trunk Highway No. 17.



FIG. 3. A scarifying grader in use on Trunk Highway No. 54, Kewaunee County. Practically all the gravel roads on the State Trunk System in Kewaunee County were scarified and re-shaped during the 1918 season.

KEWAUNEE COUNTY**Miscellaneous Items:**

Right of way purchased	\$110.00
Clearing and grubbing	164.05
Guard rail: 180 lin. ft. at 17 cts. per lin. ft.	30.45
Ditching and draining	198.25
Miscellaneous	64.35
Total cost per mile of all miscellaneous items, \$127	
Total expenditures for 1916 road construction	17,869.62
Deficit	6,897.75
Returned to village	1,128.42
Deficit carried forward	8,026.17

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915; \$5,999.78; Local, \$2,050.00; County, \$2,050.00; State, \$1,683.15; Total...	\$11,782.93
Reinforced concrete slab and girder bridges: No. built, 17; Total length, 182 ft.; containing 852.1 cu. yds. concrete; 45,000 lbs. steel; cost per ft., \$48.20 per cu. yd., \$10.30	8,773.22
Steel truss bridges: No. built, 1; Total length, 75 ft.; containing 34.9 cu. yds. concrete; 46,040 lbs. steel; cost per ft., \$32.05	2,402.22
Total No. bridges built, 18; Total length, 257 ft.; Total expenditures	11,175.44
Balance carried forward	607.49

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916: \$8,026.17; Local, \$8,600.00; County, \$8,600.00; State, \$4,649.08; Total...	\$13,822.91
Mileage: Graded and surfaced, 6.37 miles; Surfaced not graded, 0.01 miles; Total, 6.38 miles; Approximate number roads built, 7	
Grading: 6.37 miles at \$925 per mile; 12,776 cu. yds. earth moved at 46 cts. per cu. yd.; average excavation per mile, 2,000 cu. yds.	5,896.63
Culverts: 22 conc. culverts; 238.9 cu. yds. conc. at \$9.66 per cu. yd.	2,345.90
1 culvert repaired	40.00
Total cost per mile of all culverts, \$375	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 1.00 miles at \$2,315; 5,280 sq. yds. at 44 cts.	2,315.34
Pit run gravel: 5:38 miles at \$1,830; 28,400 sq. yds. at 35 cts.	9,864.60
Miscellaneous Items:	
Clearing and grubbing	117.77
Miscellaneous	28.00
Total cost per mile of all miscellaneous items, \$23	
Total expenditures for 1917 road construction	20,608.24
Deficit carried forward	6,785.33

KEWAUNEE COUNTY

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$607.49; Local \$3,- 650.00; County, \$3,650.00; State, \$1,973.15; Total...	\$9,880.64
Reinforced concrete slab and girder bridges: No. built, 7; Total length, 94 ft.; containing 423.0 cu. yds. con- crete; 24,250 lbs. steel; cost per ft., \$57.35; per cu. yd., \$12.75	
Total No. bridges built, 7; Total length, 94 ft.; Total ex- penditures	5,385.75
Balance carried forward	4,494.89

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917	\$23,703.55
Expenditures for state aid road construction	20,608.24
Expenditures for state aid bridge construction	5,385.75
Total state aid expenditures	25,993.99
Deficit for 1918	2,290.44
Total appropriation for 1918 road and bridge construc- tion	50,495.86
Amount available 1918	48,205.42

LA CROSSE COUNTY

This county is holding its own with a very intense maintenance problem. It has a very large mileage of narrow limestone macadam roads suffered to deteriorate for several years but for the past few years aggressively maintained.

New construction is proceeding at a moderate rate, using the free labor available. The reconstruction and maintenance work has been intense and in general successful, considering the type and width of road which had to be maintained.

The county is doing all that it can under all conditions prevail-
ing. It will probably be necessary to change the type of certain
of the main roads to concrete or brick if they are to be maintained
at a reasonable cost. The county feeling and organization is such
that it may be expected to meet conditions as they develop.

LA CROSSE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915. \$8,704.67; Local, \$24,160.00; County, \$40,365.85; State, \$7,954.15; Other, \$5,367.06; Total	\$86,551.73
Net amount transferred to bridge fund	2,713.64
Net total available for road construction	83,838.09

LA CROSSE COUNTY

Mileage. Graded and surfaced, 12.44 miles; Surfaced not graded, 2.08 miles; Graded not surfaced, 7.33 miles; Total 21.85 miles; Approximate number roads built, 20	
Grading: 19.77 miles at \$672 per mile; 52,272 cu. yds. earth moved at 25 cts. per cu. yd.; average excavation per mile, 2,640 cu. yds.	12, 637.36
Culverts: 44 conc. culverts; 532.6 cu. yds. conc at \$8.88 per cu. yd.	4, 730.29
1 metal culvert; 5 culverts repaired	385.10
Total cost per mile of all culverts, \$259	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 14.52 miles at \$3,455; 76,657 sq. yds. at 65 cts.	58, 335.11
Brick: (To complete work)	5, 278.37
Miscellaneous Items:	
Clearing and grubbing	35.84
Total cost per mile of all miscellaneous items, \$2	
Total expenditures for 1916 road construction	81, 402.07
Balance carried forward	2, 436.02

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$35,013.15; Local, \$4,250.00; County, \$4,250.00; State, \$4,250.00; Total	\$47, 763.15
Net amount transferred from road fund	2, 713.64
Net total available for bridge construction	50, 476.79
Reinforced concrete slab and girder bridges: No. built, 2; Total length, 16 ft.; containing, 93.9 cu. yds. concrete; 3,170 lbs. steel; cost per ft., \$59.70; per cu. yd., \$10.15	954.62
Steel I-beam bridges: No. built, 6; Total length, 138 ft.; containing 528.9 cu. yds. concrete; 51,260 lbs. steel; cost per ft., \$43.05	5, 943.86
Steel plate girder bridges: No. built, 1; Total length, 40 ft., containing 122.6 cu. yds. concrete; 17,660 lbs. steel; cost per ft., \$25.60	1, 023.96
Total No. bridges built, 9; Total length, 194 ft.; Total expenditures	7, 922.44
Balance carried forward	42, 554.35

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$2,436.02; Local, \$27,050.00; County, \$43,483.42; State, \$10,616.58; Total	\$83, 586.02
Mileage. Graded and surfaced, 6.07 miles; Surfaced not graded, 4.98 miles; Graded not surfaced, 5.37 miles; Total 16.42 miles; Approximate number roads built, 15	
Grading: 11.44 miles at \$830 per mile; 29,489 cu. yds. earth moved at 32 cts. per cu. yd.; average excavation per mile, 2,575 cu. yds.	9, 750.15



FIG. 1. A well maintained surface treated limestone macadam road on Trunk Highway No. 11. LaCrosse County.



FIG. 2. An unusual piece of bridge construction on Trunk Highway No. 21, LaCrosse County. The bridge is skewed 30 degrees to fit the stream. The spans have a clear opening of 35 feet, 24 ft. roadway. Approximate cost, \$11,500.00. A beautiful piece of work.



FIG. 3. A well maintained limestone macadam road on Trunk Highway No. 21, LaCrosse County. This road has been surface treated with Tarvia B for the past three seasons and is in very good condition at the present time.

LA CROSSE COUNTY

Culverts: 57 conc. culverts: 695.7 cu. yds. conc. at \$9.53	
per cu. yd.	\$6, 625.75
9 culverts repaired	988.05
Total cost per mile of all culverts, \$665	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 11.05 miles at \$3,960; 58,372 sq. yds. at 75 cts.	41, 830.97
Road oil: 31,615 sq. yds. at 9 cts.	2, 823.29
Miscellaneous Items:	
Right of way purchased	3, 288.75
Clearing and grubbing	60.00
Miscellaneous	725.00
Total cost per mile of all miscellaneous items, \$356	
Total expenditures for 1917 road construction	66, 091.96
Balance carried forward	17, 494.66

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$42,554.35; Local, \$3,550.00; County, \$5,707.00; State, \$1,393.90; Total	\$53, 204.35
Reinforced concrete slab and girder bridges: No. built, 5; Total length, 138 ft.; containing, 882.5 cu. yds. concrete; 54,610 lbs. steel; cost per ft., \$102.15; per cu. yd., \$16.10	
Total No. bridges built, 5; Total length, 138 ft.; total expenditures	14, 096.69
Balance carried forward	39, 107.66

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$136, 790.37
Expenditures for state aid road construction	66, 091.96
Expenditures for state aid bridge construction	14, 096.69
Total state aid expenditures	80, 188.65
Balance available for 1918	56, 601.72
Total appropriation for 1918 road and bridge construction	82, 838.02
Amount available 1918	139, 439.74

LAFAYETTE COUNTY

Construction in this county continues good, maintenance only fair.

Not much progress has been made in the biennium. The county has suffered from the lack of a driving local road sentiment. While conditions continue good they are not as satisfactory as was hoped two years ago.

LA FAYETTE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$9,080.79; Local, \$12,786.27; County, \$12,786.27; State, \$11,733.64; Advanced, \$300.00; Other, \$20.91; Total	\$46,707.88
Mileage: Graded and surfaced, .35 miles; Graded not surfaced, 7.93 miles; Total 8.28 miles; Approximate number roads built, 15	
Grading: 8.28 miles at \$1,890 per mile; 33,952 cu. yds. earth moved at 46 cts. per cu. yd.; average excavation per mile, 4,100 cu. yds.	15,652.91
Culverts: 37 conc. culverts; 500.9 cu. yds. conc. at \$10.56 per cu. yd.	5,290.33
Total cost per mile of all culverts, \$639	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.35 miles at \$2,620; 2,420 sq. yds. at 50 cts.	1,458.76
Miscellaneous Items:	
Right of way purchased	1,781.00
Clearing and grubbing	276.19
Tile underdrain	71.68
Guard rail: 2,403 lin. ft. at 30 cts per lin. ft.	768.90
Riprap	15.00
Miscellaneous (fence)	666.62
Total cost per mile of all miscellaneous items, \$432	
Total expenditures for 1916 road construction	25,981.40
Balance carried forward (after deducting advances) ..	20,426.48

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$7,777.77; Local, \$1,400.00; County, \$1,400.00; State, \$1,284.71; Total...	\$11,862.48
Reinforced concrete slab and girder bridges: No. built, 2; Total length, 16 ft.; containing 84.8 cu. yds. concrete; 4,120 lbs. steel; cost per ft., \$74.05; per cu. yd., \$14.00	
Total No. bridges built, 2; Total length, 16 ft.; Total expenditures	1,187.00
Balance carried forward	10,675.48

LA FAYETTE COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$20,426.48; Local, \$16,050.00; County, \$16,050.00; State, \$9,941.75; Total..	\$62, 468.23
Net amount transferred to bridge fund	663.61
Net total available for road construction	61, 804.62
Mileage: Graded not surfaced, 7.07 miles; Total, 7.07 miles; Approximate number roads built, 10	
Grading: 7.07 miles at \$1,380 per mile; 23,007 cu. yds. earth moved at 42 cts. per cu. yd.; average excavation per mile, 3,250 cu yds.	9, 758.24
Culverts: 24 conc. culverts: 336.8 cu. yds. conc at \$14.50 per cu yd.	4, 890.39
Total cost per mile of all culverts, \$692	
Miscellaneous Items:	
Right of way purchased	2, 697.00
Clearing and grubbing	169.15
Guard rail: 1,189 lin. ft. at 35 cts. per lin. ft.	422.37
Ditching and draining	80.50
Miscellaneous	710.75
Total cost per mile of all miscellaneous items, \$577	
Total expenditures for 1917 road construction	18, 728.40
Balance carried forward	43, 076.22

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$10,675.48; Local, \$6,283.34; County, \$6,283.34; State, \$3,892.32; Total...	\$27, 134.48
Net amount transferred from road fund	663.61
Net total available for bridge construction	27, 798.09
Reinforced concrete slab and girder bridges: No. built 10; Total length, 156 ft.; containing 691.9 cu. yds. concrete; 42,300 lbs. steel; cost per ft., \$75.00; per cu. yd., \$16.90	11, 690.13
Steel truss bridges: No. built, 3; Total length, 255 ft.; containing 783.8 cu. yds. concrete; 179,810 lbs. steel; cost per ft., \$78.95	20, 118.20
Total No. bridges built, 13; Total length, 411 ft., Total expenditures	31, 808.33
Deficit carried forward	4, 010.24

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$89, 602.71
Expenditures for state aid road construction	18, 728.40
Expenditures for state aid bridge construction	31,808.33
Total state aid expenditures	50, 536.73
Balance available for 1918	39, 065.98
Total appropriation for 1918 road and bridge construction	61, 390.27
Amount available 1918	100, 456.25

LANGLADE COUNTY

Conditions in this county are much improved. Construction is good and the maintenance good. After hesitating for several years the county board is now quite aggressively behind the road movement and further favorable developments may be expected.

It will take a large expenditure if this county is to keep pace with its neighbors, especially those to the north.

LANGLADE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$1,656.88; Local, \$5,600.00; County, \$5,600.00; State, \$5,600.00; Advanced, \$7,400.00; Other, \$9,985.30; Total	\$35,842.18
Mileage: Graded and surfaced, 2.38 miles; Surfaced not graded, 2.00 miles; Graded not surfaced, 13.93 miles; Total, 18.31 miles; Approximate number roads built, 14	
Grading: 16.31 miles at \$1,196 per mile; 53,201 cu. yds. earth moved at 37 cts. per cu. yd.; average excavation per mile, 3,260 cu. yds.	20,020.28
Culverts: 20 conc. culverts; 216.4 cu. yds. conc. at \$8.66 per cu. yd.	1,875.81
1 culvert repaired	59.02
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 4.88 miles	2,355.21
Miscellaneous Items:	
Right of way purchased	525.00
Clearing and grubbing	2,313.23
Tile underdrain	49.00
Guard rail: 3,776 lin. ft. at 22 cts. per lin. ft.	903.09
Ditching and draining	368.07
Miscellaneous	30.98
Total cost per mile of all miscellaneous items, \$257	
Total expenditures for 1916 road construction	28,499.62
Deficit carried forward (after deducting advances) ...	57.44

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$645.38; Total	\$645.38
Reinforced concrete slab and girder bridges: No. built 1; Total length, 30 ft.; containing, 89.8 cu. yds. concrete; 7,010 lbs. steel; cost per ft., \$70.60; per cu. yd., \$23.60	
Total No. bridges built, 1; Total length, 30 ft.; total expenditures	2,119.00
Deficit carried forward	1,473.62

LANGLADE COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Deficit 1916, \$57.44; Local, \$13,500.00; County, \$13,500.00; State, \$4,332.89; Advanced, \$15,250.84; Other, \$10,559.22; Total	\$57, 085.51
Mileage: Graded not surfaced, 22.71 miles; Total, 22.71 miles; Approximate number roads built, 18	
Grading: 22.71 miles at \$1,110 per mile; 80,700 cu. yds. earth moved at 33 cts. per cu. yd.; average excavation per mile, 3,550 cu. yds.	26, 984.12
Culverts: 25 conc. culverts; 232.3 cu. yds. conc. at \$12.92 per cu. yd.	3, 032.44
1 metal culvert	48.20
Total cost per mile of all culverts, \$138	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings	281.20
Crushed stone; Incomplete	335.04
Miscellaneous Items.	
Right of way purchased	275.00
Clearing and grubbing	9, 711.42
Guard rail: 6,558 lin. ft. at 24 cts. per lin. ft.	1, 542.92
Ditching and draining	1, 621.35
Miscellaneous	1, 604.60
Total cost per mile of all miscellaneous items, \$649	
Total expenditures for 1917 road construction	45, 486.29
Payments on road construction of preceding years	3, 328.78
Total road disbursements 1917	48, 815.07
Deficit (after deducting advances)	6, 980.40
Returned to local units	4, 000.00
Deficit carried forward	10, 980.40

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$1,473.62; Local, \$4,650.00; County, \$4,650.00; State, \$1,492.45; Total	\$9, 318.83
Reinforced concrete slab and girder bridges: No. built 2; Total length, 46 ft.; containing, 205.4 cu. yds. concrete; 11,310 lbs. steel; cost per ft., \$65.65; per cu. yd., \$14.70	3, 019.25
Reinforced concrete arch bridges: No. built, 1; Total length, 188 ft.; containing 777.0 cu. yds. concrete; 42,180 lbs. steel; cost per ft., \$58.15; per cu. yd., \$14.10	10, 925.90
Total No. bridges built, 3; Total length, 234 ft. total expenditures	13, 944.25
Deficit carried forward	4, 625.42

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917 ..	\$62, 404.34
Expenditures for state aid road construction	48, 815.07
Expenditures for state aid bridge construction	13, 944.25
Total state aid expenditures	62, 759.32
Deficit for 1918 (after deducting advances of \$15,250.84)	15, 605.82
Total appropriation for 1918 road and bridge construction	39, 066.53
Amount available 1918	23, 460.71



FIG. 1. An Austin-Western road planer, scarifier and roller in one, owned by Langlade County.



FIG. 2. The large planer at work on Trunk Highway No. 39, Langlade County. Note that the machine planes the entire width of the travelled way at one operation.



FIG. 3. A reinforced concrete arch bridge near Antigo, Langlade County. Built from plans originally designed for the Branch Bridge, Manitowoc County, (Fig. 2, p. 173) and at practically the same cost. Just above the bridge the stream turned abruptly to the right, passed just behind the right abutment, then turned abruptly to the left. The stream has been straightened and now passes through the left opening.

LINCOLN COUNTY

Since 1914 results in this county have been good. Sentiment is developing rapidly and in general the county is coming along better than the opening years of the State Aid law indicated could be the case.

Progress in 1918 has been disappointing and the maintenance is behind that in practically all the surrounding counties.

LINCOLN COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Deficit 1915, \$2,681.30; Local, \$10,-800.00; County, \$10,800.00; State, \$4,709.65; Advanced, \$4,500.00; Other, \$4,983.05; Total	\$33,111.40
Net amount transferred from bridge fund	1,186.06
Net total available for road construction	34,297.46
Mileage: Graded and surfaced, 0.79 miles; Surfaced not graded, 4.16 miles; Graded not surfaced, 24.51 miles; Total, 29.46 miles; Approximate number roads built, 27	
Grading: 25.80 miles at \$1,014 per mile; 96,000 cu. yds. earth moved at 28 cts. per cu. yd.; average excavation per mile, 3,800 cu. yds.	26,688.31
Culverts: 36 conc. culverts; 313.0 cu. yds. conc. at \$7.41 per cu. yd.	2,318.25
4 metal culverts; 1 culvert repaired	119.75
Total cost per mile of all culverts, \$96	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 4.95 miles at \$771; 26,823 sq. yds. at 15 cts.	4,076.56
Miscellaneous Items:	
Clearing and grubbing	848.11
Tile underdrain	77.10
Guard rail	202.50
Ditching and draining	466.47
Miscellaneous	1,652.06
Total cost per mile of all miscellaneous items, \$128	
Total expenditures for 1916 road construction	36,449.11
Deficit (after deducting advances)	6,651.65
Paid on 1915 contracts for work reported in 1915....	146.00
Deficit carried forward	6,797.65

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$8,277.78; Local, \$1,-600.00; County, \$1,600.00; State, \$697.70; Total.....	\$12,175.48
Net amount transferred to road fund	1,186.06
Net total available for bridge construction	10,989.42
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 66 ft.; containing 204.2 cu. yds. concrete; 15,270 lbs. steel; cost per ft., \$38.95; per cu. yd., \$12.60	2,569.52
Steel I-beam bridges: No. built, 1; Total length, 32 ft.; containing 28.4 cu. yds. concrete; 26,520 lbs. steel; cost per ft., \$57.25	1,831.17



FIG. 1. A newly built gravel road on Trunk Highway No. 39, Langlade County. At the time this view was taken the gravel had been in place but a few days and was not entirely compacted. The road is located across a very bad swamp and is a very desirable improvement.



FIG. 2. The Branch Bridge, Manitowoc County. Two 70 ft. arch spans, 20 ft. roadway. Approximate cost, \$11,000.00. The plans for this bridge were used without change from the bridge shown in FIG. 3, p. 171. Considerable economies are effected by the standardization of plans.

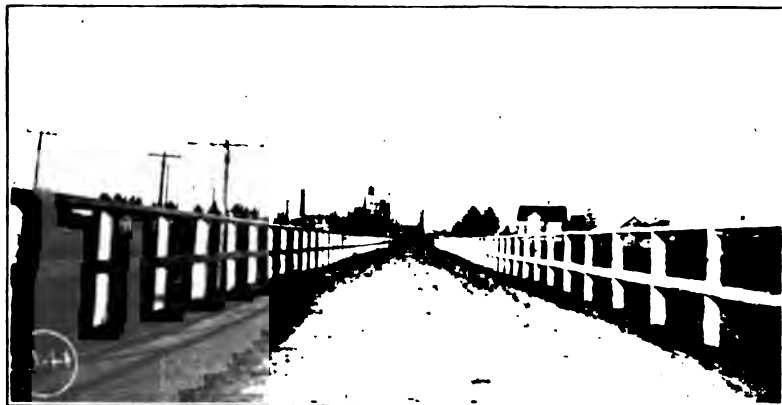


FIG. 3. A relocation on State Trunk Highway No. 10, south of Schofield, eliminating two dangerous grade crossings. The relocation is about one mile in length and consists of a heavy fill a greater portion of the distance.

LINCOLN COUNTY

Total No. bridges built, 4; Total length, 98 ft; Total expenditures	\$4, 400.69
Balance carried forward	6, 588.73

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$6,797.65; Local, \$13,-200.00; County, \$21,433.78; State, \$4,966.22; Other, \$2,779.18; Total	\$35, 581.53
Mileage: Graded and surfaced, 2.35 miles; Surfaced not graded, 7.15 miles; Graded not surfaced, 10.58 miles; Total, 20.08 miles; Approximate number roads built, 25	
Grading: 12.93 miles at \$1,250 per mile; 39,000 cu. yds. earth moved at 47 cts. per cu. yd.; average excavation per mile, 3,016 cu. yds.	18, 593.80
Culverts: 12 conc. culverts; 105.3 cu. yds. conc. at \$9.90 per cu. yd.	1, 044.75
3 metal culverts	96.81
Total cost per mile of all culverts, \$88	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 9.50 miles at \$837; 50,120 sq. yds. at 16 cts.	7, 945.58
Miscellaneous Items:	
Clearing and grubbing	1, 376.54
Guard rail: 1,570 lin. ft. at 22 cts. per lin. ft.	346.24
Ditching and draining	74.75
Miscellaneous	2, 287.10
Total cost per mile of all miscellaneous items, \$316	
Total expenditures for 1917 road construction	31, 765.57
Balance carried forward	3, 815.96

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$6,588.73; Local, \$1,-500.00; County, \$2,435.65; State, \$564.35; Total	\$11,088.73
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 64 ft.; containing 304.3 cu. yds. concrete; 18,950 lbs. steel; cost per ft., \$74.15; per cu. yd., \$15.60	
Total No. bridges built, 4; Total length, 64 ft; Total expenditures	4, 742.04
Balance carried forward	6, 346.69

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$46, 670.26
Expenditures for state aid road construction	31, 765.57
Expenditures for state aid bridge construction	4, 742.04
Total state aid expenditures	36, 507.61
Balance available for 1918	10, 162.65
Total appropriation for 1918 road and bridge construction	32, 055.03
Amount available 1918	42, 217.68

MANITOWOC COUNTY

This county has been progressing at a good steady rate, after a slow start under the State Aid law. Construction has been consistently good and the maintenance this year is good. Conditions must be considered as satisfactory.

MANITOWOC COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$1,411.18; Local, \$8,750.00; County, \$15,750.00; State, \$12,396.00; Other, \$9.43; Total	\$38, 316.61
Mileage: Graded and surfaced, 11.56 miles; Graded not surfaced, 9.03 miles; Total, 11.59 miles; Approximate number roads built, 13	
Grading: 11.59 miles at \$989 per mile; 30,160 cu. yds. earth moved at 38 cts. per cu. yd.; average excavation per mile, 2,600 cu. yds.	11, 476.80
Culverts: 43 conc. culverts; 487.2 cu. yds. conc. at \$8.85 per cu. yd.	4, 307.51
1 culvert repaired	16.50
Total cost per mile of all culverts, \$371	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 1.61 miles at \$1,920; 8,650 sq. yds. at 26 cts.	3, 150.37
Crushed gravel: 9.33 miles at \$1,460; 51,948 sq. yds. at 29 cts.	14, 858.64
Quarry chips: 0.62 miles at \$1,520; 3,300 sq. yds. at 28 cts.	942.13
Miscellaneous Items:	
Clearing and grubbing	279.62
Tile underdrain	169.44
Miscellaneous	165.05
Total cost per mile of all miscellaneous items, \$53	
Total expenditures for 1916 road construction	35, 366.96
Balance carried forward	2, 950.55

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$3,793.36; Local, \$4,950.00; County, \$4,950.00; State, \$4,950.00; Total	\$18, 643.36
Reinforced concrete slab and girder bridges: No. built, 12; Total length, 283 ft.; containing, 1,242.4 cu. yds. concrete; 77,460 lbs. steel; cost per ft., \$55.40; per cu. yd., \$12.65	15, 683.71
Reinforced concrete arch bridges: No. built, 1; Total length, 188 ft.; containing 777.0 cu. yds. concrete; 42,180 lbs. steel; cost per ft., \$59.25; per cu. yd., \$14.35	11, 134.11
Total No. bridges built, 13; Total length, 471 ft.; Total expenditures	26, 817.82
Deficit carried forward	8, 174.46

MANITOWOC COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$2,950.55; Local, \$18,820.00; County, \$18,820.00; State, \$12,955.15; Other, \$1,756.89; Total	\$55,302.59
Mileage: Graded and surfaced, 6.85 miles; Total, 6.85 miles; Approximate number roads built, 10	
Grading: 6.85 miles at \$685 per mile; 11,960 cu. yds. earth moved at 34 cts. per cu. yd.; average excavation per mile, 1,745 cu. yds.	4,046.58
Culverts: 28 conc. culverts; 348.2 cu. yds. conc. at \$14.20 per cu. yd.	5,048.09
Total cost per mile of all culverts, \$736	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.49 miles at \$2,700; 2,600 sq. yds. at 30 cts.	782.01
Crushed gravel: 6.36 miles at \$2,020; 33,600 sq. yds. at 38 cts.	13,185.32
Miscellaneous Items.	
Clearing and grubbing	408.36
Tile underdrain	129.45
Guard rail	9.80
Total cost per mile of all miscellaneous items, \$80	
Total expenditures for 1917 road construction	23,609.61
Balance carried forward	31,692.98

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$8,174.46; Local, \$7,225.00; County, \$7,225.00; State, 4,973.46; Total	\$11,249.00
Reinforced concrete slab and girder bridges: No. built, 6; Total length, 108 ft.; containing, 444.4 cu. yds. concrete; 29,410 lbs. steel; cost per ft., \$69.50; per cu. yd., \$14.75	
Total No. bridges built, 6; Total length, 108 ft.; total expenditures	6,539.75
Balance carried forward	4,709.25

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$66,551.59
Expenditures for state aid road construction	23,609.61
Expenditures for state aid bridge construction	6,539.75
Total state aid expenditures	30,149.36
Balance available for 1918	36,402.23
Total appropriation for 1918 road and bridge construction	58,897.91
Amount available 1918	95,300.14

MARATHON COUNTY

This county made a very slow start under the State Aid law which met considerable opposition both from the people in general and from the county board. Unfortunate contentions between former county highway commissioners and the county board delayed advances for several years. Under the new county highway commissioner, conditions are improving. The county has adopted the county trunk system, is doing a large amount of heavy maintenance work and sentiment is rapidly growing better.

This county must be considered as now moving in a satisfactory manner and ripe for further development.

MARATHON COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$539.02; Local, \$10,- 867.00; County, \$10,867.00; State, \$6,791.87; Ad- vanced, \$1,700.00; Other, \$456.11; Total	\$30,142.96
Net amount transferred from bridge fund	1,542.64
Net total available for road construction	31,685.60
Mileage: Graded and surfaced, 3.67 miles; Surfaced not graded, 0.11 miles; Graded not surfaced, 12.58 miles; Total, 16.36 miles; approximate number roads built, 23	
Grading: 16.25 miles at \$850 per mile; 49,499 cu. yds. earth moved at 28 cts. per cu. yd.; average excava- tion per mile, 3,040 cu. yds.	13,815.14
Culverts: 16 conc. culverts; 180.8 cu. yds. conc. at \$10.85 per cu. yd.	1,962.96
13 metal culverts; 1 culvert repaired	689.31
Total cost per mile of all culverts, \$163	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 0.65 miles at \$236; 3,425 sq. yds. at 4 cts.	153.62
Disintegrated granite: 3.13 miles at \$1,626; 21,993 sq. yds. at 31 cts.	6,763.55
Miscellaneous Items:	
Clearing and grubbing	1,553.91
Guard rail: 888 lin. ft. at 28 cts. per lin. ft.	244.95
Ditching and draining	131.10
Riprap	302.79
Miscellaneous	402.11
Total cost per mile of all miscellaneous items, \$162	
Total expenditures for 1916 road construction	26,019.44
Payments on road construction of preceding years	50.49
Total road disbursements, 1916	26,069.93
Balance (after deducting advances)	3,915.67
Returned to town	42.00
Balance carried forward	3,873.67

MARATHON COUNTY**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1915, \$1,615.15; Local, \$14,-650.00; County, \$14,650.00; State, \$9,164.68; \$20.00 credit through error in 1915 report; Total	\$40,099.83
Net amount transferred to road fund	1,542.64
Net total available for bridge construction	38,557.19
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 40 ft.; containing 167.6 cu. yds. concrete; 7,990 lbs. steel; cost per ft., \$48.80; per cu. yd., \$11.65	1,950.08
Steel I-beam bridges: No. built, 1; Total length, 14 ft.; containing 63.2 cu. yds. concrete; 4,060 lbs. steel; cost per ft., \$54.60	764.00
Steel Truss bridges: No. built, 3; Total length, 1,367 ft.; containing 1,646.6 cu. yds. concrete; 796,910 lbs. steel; cost per ft., \$31.35	42,823.49
Total No. bridges built, 8; Total length, 1,421 ft.; Total expenditures	45,537.57
Deficit carried forward	6,980.38

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$3,873.67; Local, \$16,-125.00; County, \$16,125.00; State, \$12,794.90; Advanced, \$3,570.00; Other, \$246.82; Total	\$52,735.39
Net amount transferred to bridge fund	206.21
Net total available for bridge construction	52,529.18
Mileage: Graded and surfaced, 4.91 miles; Surfaced not graded, 1.06 miles; Graded not surfaced, 11.05 miles; Total, 17.02 miles; Approximate number roads built, 23	
Grading: 15.96 miles at \$772 per mile; 36,615 cu. yds. earth moved at 34 cts. per cu. yd.; average excavation per mile, 2,293 cu. yds.	12,303.30
Culverts: 23 conc. culverts; 265.8 cu. yds. conc. at \$11.50 per cu. yd.	3,053.80
1 metal culvert	34.20
Total cost per mile of all culverts, \$193	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.18 miles at \$3,060; 971 sq. yds. at 67 cts.	660.52
Pit run gravel: 3.12 miles at \$1,280; 18,784 sq. yds. at 24 cts.	4,559.87
Disintegrated granite: 2.67 miles at \$1,460; 15,566 sq. yds. at 27 cts.	4,281.59
Miscellaneous Items:	
Clearing and grubbing	1,562.74
Guard rail: 653 lin. ft. at 41 cts. per lin. ft.	271.10
Miscellaneous	705.13
Total cost per mile of all miscellaneous items, \$159	
Total expenditures for 1917 road construction	27,432.25
Balance (after deducting advances)	21,526.93
Returned to local units	1,118.00
Balance carried forward	20,408.93



FIG. 1. A patrolman taking the waves out of a gravel surface with a light grader on Trunk Highway No. 16, Marathon County. This section was in excellent condition at the time the view was taken.



FIG. 2. The County State Road and Bridge Committee and County Highway Commissioner of Juneau County investigating gang maintenance work being done on Trunk Highway No. 13, Marathon County. The work consisted of heavy blade grader work as shown. Note the clean cut ditch and shoulder lines. The operator has his machine in position to trim the banks to the proper slope.



FIG. 3. A view on Trunk Highway No. 13, Marathon County, immediately south of Colby. This view was taken the day immediately following

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1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$6,980.38; Local, \$5,-400.00; County, \$5,400.00; State, \$4,277.00; Total..	\$8, 096.67
Net amount transferred from road fund	206.21
Net total available for bridge construction	8, 302.83
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 42 ft.; containing 173.8 cu. yds. concrete; 8,990 lbs. steel; cost per ft., \$67.15; per cu. yd., \$16.20	2, 819.90
Steel I-beam bridges: No. built, 1; Total length, 16 ft.; containing 39.1 cu. yds. concrete; 3,970 lbs. steel; cost per ft., \$35.00	560.00
Steel truss bridges: No. built, 2; Total length, 211 ft.; containing 381.5 cu. yds. concrete; 133,780 lbs. steel; cost per ft., \$58.15	12, 257.88
Total No. bridges built, 6; Total length, 269 ft.; Total expenditures	15, 637.78
Deficit carried forward	7, 334.95

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917 ..	\$59, 714.01
Expenditures for state aid road construction	27, 432.25
Expenditures for state aid bridge construction	15, 637.78
Total state aid expenditures	43, 070.03
Balance available for 1918 (after deducting advances of \$3,570.00)	13, 073.98
Total appropriation for 1918 road and bridge construction	40, 829.80
Amount available 1918	53, 903.78

MARINETTE COUNTY

This county is proceeding at its normal rate and has a long and successful good roads history behind it. The work is consistent and the maintenance is good.

This county has always gone ahead without hesitation and considering its newness and low valuations has always gotten very satisfactory results.

MARINETTE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$9,097.58; Local, \$12,961.00; County, \$12,961.00; State, \$7,854.01; Advanced, \$2,009.00; Other, \$4,950.26; Total	\$49, 823.85
Mileage: Graded and surfaced, 6.97 miles; Surfaced not graded, 2.63 miles; Graded not surfaced, 16.35 miles; Total, 25.95 miles; Approximate number roads built,	

MARINETTE COUNTY

Grading: 23.32 miles at \$961 per mile; 70,351 cu. yds. earth moved at 32 cts. per cu. yd.; average excavation per mile, 3,010 cu. yds.	\$22,424.94
Culverts: 20 conc. culverts; 309.1 cu. yds. conc. at \$5.60 per cu. yd.	1,731.59
3 metal culverts	128.49
Total cost per mile of all culverts, \$80	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.07 miles; 400 sq. yds. at 84 cts.	336.75
Crushed Gravel: 2.92 miles at \$1,180; 15,380 sq. yds. at 22 cts.	4,598.99
Pit run gravel: 6.61 miles at \$1,083; 34,995 sq. yds. at 20 cts.	7,157.67
Miscellaneous Items:	
Clearing and grubbing	369.28
Guard rail. 470 lin. ft. at 15 cts. per lin. ft.	68.50
Miscellaneous	2,010.60
Total cost per mile of all miscellaneous items, \$105	
Total expenditures for 1916 road construction	38,826.81
Balance carried forward (after deducting advances) ..	8,997.04

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$334.22; Local, \$300.00; County, \$300.00; State, \$181.79; Total	\$1,116.01
Balance carried forward	1,116.01

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$8,997.04; Local, \$11,925.00; County, \$11,925.00; State, \$6,270.00; Other, \$2,465.09; Total	\$41,582.13
Mileage: Graded and surfaced, 1.23 miles; Surfaced not graded, 11.00 miles; Graded not surfaced, 11.37 miles; Total, 23.53 miles; Approximate number roads built, 21	
Grading: 12.53 miles at \$978 per mile; 39,983 cu. yds. earth moved at 31 cts. per cu. yd.; average excavation per mile, 3,190 cu. yds.	12,263.04
Culverts: 17 conc. culverts; 178.7 cu. yds. conc. at \$6.05 per cu. yd.	1,154.27
Total cost per mile of all culverts, \$92	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 12.23 miles at \$1,095; 68,530 sq. yds. at 14 cts.	14,351.01
Miscellaneous Items:	
Clearing and grubbing	1,359.95
Guard rail: 275 lin. ft. at 17 cts. per lin. ft.	46.58
Miscellaneous	1,212.61
Total cost per mile of all miscellaneous items, \$209	
Total expenditures for 1917 road construction	30,387.46
Balance	11,194.67
Returned to local units	800.00
Balance carried forward	10,394.67

MARINETTE COUNTY**1917 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1916, \$1,116.01; Local, \$3,859.00; County, \$3,850.00; State, \$2,024.28; Total	\$10,840.29
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 30 ft.; containing 120.1 cu. yds. concrete; 6,620-lbs. steel; cost per ft., \$44.15; per cu. yd., \$11.00	
Total No. bridges built, 1; Total length, 30 ft.; total expenditures	1,323.96
Balance carried forward	9,516.33

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$51,622.42
Expenditures for state aid road construction	30,387.46
Expenditures for state aid bridge construction	1,323.96
Total state aid expenditures	31,711.42
Balance available for 1918	19,911.00
Total appropriation for 1918 road and bridge construction	28,184.42
Amount available 1918	48,095.42

MARQUETTE COUNTY

This county is proceeding slowly, development being much more rapid in certain sections than in others. The county organization is getting good results with the funds it is allowed to use, but is getting practically no support from the county board. This is another case where the wideawake citizens of the county should get more strongly behind the road management if real results are to be secured.

This is one of the few counties where the main idea of the majority of the county board is to see how little support can be given to the highway movement rather than how much.

MARQUETTE COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$6,930.47; Local, \$6,-400.00; County, \$6,400.00; State, \$3,460.35; Other, \$254.00; Total	\$23,444.82
Mileage: Graded and surfaced, 6.38 miles; Graded not surfaced, 0.62 miles; Total, 7.00 miles; Approximate number roads built, 16	
Grading: 7.00 miles at \$365 per mile; 16,442 cu. yds. earth moved at 16 cts. per cu. yd.; average excavation per mile, 2,350 cu. yds.	2,555.96

MARQUETTE COUNTY

Culverts: 11 conc. culverts; 124.7 cu. yds. conc. at \$6.59 per cu. yd.	\$821.16
3 culverts repaired	201.87
Total cost per mile of all culverts, \$146	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.36 miles at \$3,579; 1,920 sq. yds. at 67 cts.	1,288.30
Crushed gravel: 0.81 miles at \$1,868; 4,285 sq. yds. at 35 cts.	1,513.56
Pit run gravel: 1.18 miles at \$1,244; 6,234 sq. yds. at 24 cts.	1,468.50
Clay and granite: 4.03 miles at \$2,415; 27,754 sq. yds. at 46 cts.	12,714.94
Miscellaneous Items:	
Clearing and grubbing	71.00
Tile underdrain	26.70
Guard rail: 144 lin. ft. at 20 cts. per lin. ft.	28.18
Riprap	160.01
Miscellaneous	22.10
Total cost per mile of all miscellaneous items, \$44	
Total expenditures for 1916 road construction	20,872.28
Balance carried forward	2,572.54

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$113.85; Total	\$113.85
Balance carried forward	113.85

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$2,572.54; Local, \$9,900.00; County, \$9,900.00; State, \$3,364.18; Advanced, \$1,200.00; Other, \$41.93; Total	\$26,978.65
Net amount transferred to bridge fund	1,270.34
Net total available for road construction	25,708.31
Mileage: Graded and surfaced, 6.53 miles; Surfaced not graded, 0.06 miles; Graded not surfaced, 0.10 miles; Total, 6.69 miles; Approximate number roads built, 11	
Grading: 6.63 miles at \$484 per mile; 14,565 cu. yds. earth moved at 22 cts. per cu. yd.; average excavation per mile, 2,200 cu. yds.	3,206.82
Culverts: 10 conc. culverts; 100.8 cu. yds. conc. at \$9.22 per cu. yd.	929.63
1 metal culvert; 2 culverts repaired	195.66
Total cost per mile of all culverts, \$170	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.98 miles at \$3,730; 5,200 sq. yds. at 70 cts.	3,655.30
Pit run gravel: 2.55 miles at \$1,090; 13,478 sq. yds. at 20 cts.	2,777.25
Concrete: 0.04 miles at 217 sq. yds. at \$1.23	266.23
Disintegrated granite: 3.02 miles at \$2,650; 17,125 sq. yds. at 50 cts.	8,590.16

MARQUETTE COUNTY

Miscellaneous Items:

Tile underdrain	128.36
Guard rail: 399 lin. ft. at 31 cts. per lin. ft.	123.96
Miscellaneous	78.75
Total cost per mile of all miscellaneous items, \$50	
Total expenditures for 1917 road construction	19,952.12
Balance carried forward (after deducting advances) ..	4,556.19

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$113.85; Local, 700.00; County, \$700.00; State, \$237.87; Total.....	\$1,751.72
Net amount transferred from road fund	1,270.34
Net total available for bridge construction	3,022.06
Steel truss bridges: No. built, 1; Total length, 60 ft.; containing 48.0 cu. yds. concrete; 29,700 lbs. steel; cost per ft., \$57.40	
Total No. bridges built, 1; Total length, 60 ft.; Total expenditures	3,445.00
Deficit carried forward	422.94

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$28,730.37
Expenditures for state aid road construction	19,952.12
Expenditures for state aid bridge construction	3,445.00
Total state aid expenditures	23,397.12
Balance available for 1918 (after deducting advances of \$1,200.00)	4,133.25
Total appropriation for 1918 road and bridge construction	20,407.41
Amount available 1918	24,540.66

MILWAUKEE COUNTY

Milwaukee County has consistently gone ahead with its program of building high class concrete roads. Some sheet asphalt has been constructed and a little vitrified brick. No other types of road are built in this county and of the total mileage built under the State Aid law (154 miles, including this year's work) 136 miles have been of concrete.

As far as is known no county in America, except possibly Wayne County, Michigan, has as adequate a system of roads as has Milwaukee County. Practically all of them are concrete roads 18 feet wide, well maintained, and with good shoulder maintenance. The work has consistently had excellent support from the county board and from the county state road and bridge committee, to whom together with the county highway commissioners, is due largely the success of the work.

Milwaukee County also stands alone among American counties in that it has obtained a high class road system without bond issues, the whole cost being defrayed by state and county taxation from year to year.

While the program was somewhat cut in 1917, and much reduced in 1918, the county has not finished building roads, but is simply patriotically holding off during the present shortage of men and materials.

MILWAUKEE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$30,633.15; Local, \$1,000.00; County, \$270,000.00; State, \$172,185.60;	
Other, \$60,000.40; Total	\$533,819.15
Net amount transferred to bridge fund	67,791.10
Net total available for road construction	466,028.05
Mileage: Graded and surfaced, 22.57 miles; Graded not surfaced, 3.82 miles; Total, 26.39 miles; Approximate number roads built 16	
Grading: 26.39 miles at \$2,685 per mile; 135,156 cu. yds. earth moved at 52 cts. per cu. yd.; average excavation per mile, 5,120 cu. yds.	
	70,890.19
Culverts: 113 conc. culverts; 1,913.0 cu. yds. conc. at \$11.87 per cu. yd.	
	22,709.89
Total cost per mile of all culverts, \$869	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Concrete: 19.60 miles at \$6,630; 203,265 sq. yds. at \$1.26 cts.	
	255,736.55
Sheet asphalt: 2.97 miles at \$10,600; 52,320 sq. yds. at \$2.00	
	104,908.19

MILWAUKEE COUNTY**Miscellaneous Items:**

Right of way purchased	\$830.92
Sewer	150.38
Curb and gutter	8,031.66
Guard rail: 10,640 lin ft. at 44 cts. per lin. ft.	4,682.95
Retaining wall	5,714.90
Miscellaneous	1,076.91
Total cost per mile of all miscellaneous items, \$777	
Total expenditures for 1916 road construction	474,730.54
Deficit carried forward	8,702.49

1916 STATE AID BRIDGE CONSTRUCTION**Funds Available:**

Net amount transferred from road fund	\$67,791.10
Net total available for bridge construction	67,791.10
Reinforced concrete slab and girder bridges: No. built, 11; Total length, 234 ft.; containing, 1131.3 cu. yds. concrete; 67,190 lbs. steel; cost per ft., \$72.60; per cu. yd., \$15.00	16,984.21
Reinforced concrete arch bridges: No. built, 4; Total length, 395 ft.; containing, 3,163.0 cu. yds. concrete; 154,120 lbs. steel; cost per ft., \$128.70; per cu. yd., \$16.05	50,806.89
Total No bridges built, 15; Total length, 629 ft.; total expenditures	67,791.10

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$8,702.49; Local, \$2,000.00; County, \$270,000.00; State, \$176,900.12; Other, \$100,000.00; Total	\$549,197.63
Net amount transferred to bridge fund	48,380.63
Net total available for road construction	491,817.00
Mileage: Graded and surfaced, 17.68 miles; Surfaced not graded, 3.81 miles; Total 21.49 miles; Approximate number roads built, 19	
Grading: 17.68 miles at \$4,390 per mile; 120,610 cu. yds. earth moved at 64 cts. per cu. yd.; average excavation per mile, 6,800 cu. yds.	79,063.29
Culverts: 65 conc. culverts; 1,787.7 cu. yds. conc. at \$12.80 per cu. yd.	22,736.86
Total cost per mile of all culverts, \$1,285	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Concrete: 20.97 miles at \$8,150; 224,009 sq. yds. at \$154	345,732.55
Sheet asphalt: 0.25 miles at \$11,750; 7,900 sq. yds. at \$2.22	17,580.76
Sand stone: 0.27 miles at \$22,150; 3,999 sq. yds. at \$4.19	16,772.43



FIG. 1. A ribbed arch bridge. Span 70 ft., roadway 24 ft. with two cantilevered sidewalks. Built on the low level road across the Menomonee Valley in the outskirts of Milwaukee. Note the Grand Avenue viaduct in the background. This arch was built in very cold weather during the severe winter of 1917-1918.



FIG. 2. A reinforced concrete trestle, 15 spans of 25 ft. clear opening, 24 ft. roadway, two cantilevered sidewalks. This structure is about 200 feet west of the arch shown in Fig. 1. The trestle is built on a grade to clear the C. M. & St. P. tracks at the left of the picture.



FIG. 3. A wash-out on the Watertown Plank Road, Milwaukee County immediately west of Lovers Lane. The hole was immediately filled by the county. There was no resulting damage to the concrete surface.

MILWAUKEE COUNTY

Miscellaneous Items:

Right of way purchased	\$885.85
Curb and gutter	2,806.96
Guard rail: 4,338 lin. ft. at 39 cts. per lin. ft.	1,687.93
Sewer	5,674.76
Miscellaneous	285.60
Total cost per mile of all miscellaneous items, \$641	
Total expenditures for 1917 road construction	493,226.00
Deficit	1,409.00
Error reported in 1915	55.00
Deficit carried forward	1,464.00

1917 STATE AID BRIDGE CONSTRUCTION

Net amount transferred from road fund	\$48,380.63
Net total available for bridge construction	48,380.63
Reinforced concrete slab and girder bridges: No. built, 6; Total length, 526 ft.; containing, 1,872.6 cu. yds. concrete; 190,400 lbs. steel; cost per ft., \$74.55; per cu. yd. \$20.90	39,188.13
Reinforced concrete arch bridges: No. built, 1; Total length, 70 ft.; containing 699.0 cu. yds. concrete; 51,060 lbs. steel; cost per ft., \$131.30; per cu. yd. \$13.15	9,192.50
Total No. bridges built, 7; Total length, 596 ft.; total expenditures	48,380.63

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$540,142.63
Expenditures for state aid road construction	493,226.00
Expenditures for state aid bridge construction	48,380.63
Total state aid expenditures	541,606.63
Deficit for 1918	1,464.00
Total appropriation for 1918 road and bridge construction	380,982.88
Amount available 1918	379,518.88



FIG. 1. A fleet of army trucks moving towards the sea coast over one of Milwaukee County's famous concrete highways. Rainy weather has no terrors for travelers on these roads.



FIG. 2. A view showing an important road intersection on Trunk Highway No. 17, Milwaukee County. Note the large signs located on the corners which are both dangerous and unsightly. Also note the traffic cop whose services are necessary on certain days on Milwaukee County's country roads.



FIG. 3. A view of the monthly street fair at Hale's Corners, Milwaukee County. The farmers certainly appreciate the wide concrete road which adds greatly to their convenience in conducting their monthly fair.

MONROE COUNTY

From a slow start this county has rapidly gained momentum until good roads sentiment is overwhelming. The results in the last few years have been good and the maintenance this year is very good. The costs are high as the county is hilly and surfacing materials scarce, but despite these handicaps the county is advancing rapidly.

MONROE COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Deficit 1915, \$5,328.20; Local, \$26,-206.72; County, \$26,206.72; State, \$8,455.76; Advanced, \$2,725.00; Other, \$1,861.15; Total	\$69,127.15
Mileage: Graded and surfaced, 6.31 miles; Surfaced not graded, 4.12 miles; Graded not surfaced, 6.46 miles; Total, 16.89 miles; Approximate number roads built, 38	
Grading: 12.77 miles at \$820 per mile; 41,415 cu. yds. earth moved at 25 cts. per cu. yd.; average excavation per mile, 3,240 cu. yds.	10,479.68
Culverts: 46 conc. culverts, 622.2 cu. yds. conc. at \$10.38 per cu. yd.	6,563.63
3 culverts repaired	91.08
Total cost per mile of all culverts, \$520	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 5.01 miles at \$3,985; 29,906 sq. yds. at 75 cts.	20,488.82
Crushed gravel: 1.50 miles at \$4,290; 8,348 sq. yds. at 81 cts.	7,307.89
Concrete: 0.11 miles; 548 sq. yds. at \$1.51	826.52
Shale: 3.81 miles at \$1,167; 20,150 sq. yds. at 22 cts. . .	4,730.78
Oiling: 40,314 sq. yds. at 6.6 cts.	2,666.92
Miscellaneous Items:	
Right of way purchased	1,312.00
Clearing and grubbing	213.33
Tile underdrain	59.55
Guard rail: 4,564 lin. ft. at 20 cts. per lin. ft.	934.48
Miscellaneous	177.88
Total cost per mile of all miscellaneous items, \$211	
Total expenditures for 1916 road construction	55,852.56
Balance carried forward (after deducting advances) ..	1,549.59

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$374.28; Local, \$975.00; County, \$975.00; State, \$314.59; Total	\$2,638.87
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 16 ft.; containing 66.2 cu. yds. concrete; 3,360 lbs. steel; cost per ft., \$58.25; per cu. yd. \$14.10	931.63
Total No. bridges built, 1; Total length, 16 ft.; Total expenditures	931.63
Balance carried forward	1,707.24



FIG. 1. A view on Trunk Highway No. 12, Monroe County, showing some excellent blade grader gang maintenance work.



FIG. 2. An earth road, part of State Trunk Highway No. 12, Monroe County, showing the effect of good patrol maintenance.



FIG. 3. A well maintained 9 ft. surface treated stone macadam road on Trunk Highway No. 21, Monroe County.

MONROE COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$1,549.59; Local, \$29,- 006.00; County, \$28,606.00; State, \$8,800.16; Ad- vanced, \$671.15; Other, \$1,396.42; Total	\$70,029.32
Net amount transferred from bridge fund	1,266.97
Net total available for road construction	71,296.29
Mileage: Graded and surfaced, 5.84 miles; Surfaced not graded, 2.63 miles; Graded not surfaced, 7.14 miles; Total, 15.61 miles; Approximate number roads built, 35	
Grading: 12.98 miles at \$719 per mile; 40,900 cu. yds. earth moved at 27 cts. per cu. yd.; average excava- tion per mile, 3,150 cu. yds.	11,086.45
Culverts: 54 conc. culverts; 640.0 cu. yds. conc. at \$9.06 per cu. yd.	5,855.00
5 culverts repaired	314.79
Total cost per mile of all culverts, \$475	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 4.08 miles at \$4,030; 22,020 sq. yds. at 76 cts.	19,354.93
Concrete: 1.27 miles at \$7,710; 6,685 sq. yds. at \$1.46	9,797.71
Shale: 3.12 miles at \$1,078; 16,450 sq. yds. at 20 cts...	7,790.15
Miscellaneous Items:	
Right of way purchased	1,681.93
Clearing and grubbing	91.75
Tile underdrain	102.58
Guard rail	198.74
Miscellaneous	150.26
Total cost per mile of all miscellaneous items, \$171	
Total expenditures for 1917 road construction	56,424.29
Balance carried forward (after deducting advances)..	14,200.85

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$1,707.24; Local, \$1,- 200.00; County, \$1,200.00; State, \$369.16; Total	\$4,476.40
Net amount transferred to road fund	1,266.97
Net total available for bridge construction	3,209.43
Balance carried forward	3,209.43

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917 ...	\$74,505.72
Expenditures for state aid road construction	56,424.29
Expenditures for state aid bridge construction	
Total state aid expenditures	56,424.29
Balance available for 1918 (after deducting advances of \$671.15)	17,410.28
Total appropriation for 1918 road and bridge construc- tion	67,626.30
Amount available 1918	85,036.58



FIG. 1. An old bridge near Wilton, Monroe County. A type of structure rapidly being displaced.



FIG. 2. The economical and permanent reinforced concrete structure which replaced the old bridge shown in Fig. 1.



FIG. 3. A view on the Schultz Hill, Monroe County. A 30 ft. side fill on a $7\frac{1}{4}\%$ grade. Guard rail placed later.

OCONTO COUNTY

This county has done some good work but has responded rather slowly to the road movement in general. The county board has never enthusiastically supported road construction but has rather done what the law forced it to do.

There are evidences of better feeling and the results this year, both in construction and maintenance, are much improved, and there appears now to be no reason why this county will not make satisfactory progress.

OCONTO COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$201.00; Local, \$6,200; County, \$6,200.00; State, \$6,200.00; Advanced, \$1,-800.00; Total,	\$20,601.00
Mileage: Graded and surfaced, 6.91 miles; Graded not surfaced, 2.31 miles; Total, 9.22 miles; Approximate number roads built, 9.	
Grading: 922 miles at \$700 per mile; 26,100 cu. yds. earth moved at 25 cts. per cu. yd.; average excavation per mile, 2,830 cu. yds.	6,455.33
Culverts: 17 conc. culverts; 176.2 cu. yds. conc. at \$9.25 per cu. yd.	1,629.81
Total cost per mile of all culverts, \$177.	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 0.76 miles at \$194 per mile	147.34
Pit run gravel: 6.15 miles at \$926; 32,480 sq. yds. at 17 cts.	6,287.11
Miscellaneous Items:	
Clearing and Grubbing	48.65
Tile underdrain	7.97
Guard rail: 600 lin. ft. at 7 cts. per lin. ft.	37.12
Ditching and draining	352.77
Total cost per mile of all miscellaneous items, \$48	
Total expenditures for 1916 road construction	14,966.10
Payments on road construction of preceding years	334.95
Total road disbursements 1916	15,301.05
Balance carried forward (after deducting advances) ..	3,499.95

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Bal., 1915, \$5,207.20; Total	\$5,207.20
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 10 ft.; containing, 49.8 cu. yds. concrete; 2,210 lbs. steel; cost per ft., \$44.50; per cu. yd., \$8.95	
Total No. bridges built, 1; Total length, 10 ft.; Total expenditures	444.80
Balance carried forward	4,762.40



FIG. 1. The manner in which Oneida County has constructed many miles of first class road at a very low cost per mile. A 40 to 60 horse power tractor is used for power, pulling a heavy 10 ft. blade grader. The cost of this job, including heavy grubbing, was approximately \$350.00 per mile.



FIG. 2. The manner in which the surplus dirt at the high places is moved to the low places, following the tractor and grader.



FIG. 3. A view of the same road as Fig. No. 1. Note the straight, clean-cut ditch line. This road is nearing completion.

OCONTO COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance, 1916, \$3,499.95; Local \$11,000.00; County, \$11,000.00; State, \$5,515.25; Other, \$456.92; Total	\$31,472.12
Net amount transferred from bridge fund	1,502.18
Net total available for road construction	32,974.30
Mileage: Graded and surfaced, 5.44 miles; Surfaced not graded, 2.75 miles; Graded not surfaced, 10.49 miles; Total 18.68 miles; Approximate number roads built, 21	
Grading: 16.93 miles at \$695 per mile; 31,384 cu. yds. earth moved at 37 cts. per cu. yd.; average excavation per mile, 1,850 cu. yds.	11,777.26
Culverts: 36 conc. culverts; 419.5 cu. yds. conc. at \$12.42 per cu. yd.	5,208.47
7 culverts repaired	415.61
Total cost per mile of all culverts, \$332	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 9.19 miles at \$987; 49,100 sq. yds. at 19 cts.	9,879.45
Miscellaneous Items:	
Clearing and Grubbing	611.09
Guard rail; 175 lin. ft. at 12 cts. per lin. ft.	20.30
Miscellaneous	47.62
Total cost per mile of all miscellaneous items, \$40	
Total expenditures for 1917 road construction	27,950.80
Balance	5,023.50
Returned to local units	150.00
Balance carried forward	4,873.50

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$4,762.40; Local, \$2,500.00; County, \$2,500.00; State \$1,249.95; Total..	\$11,012.35
Net amount transferred to road fund	1,502.18
Net total available for bridge construction	9,510.17
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 82 ft.; containing, 311.0 cu. yds. concrete; 19,850 lbs. steel; cost per ft., \$67.70 per cu. yd., \$17.85	
Total No. bridges built, 4; Total length, 82 ft.; total expenditures	5,552.46
Balance carried forward	3,957.71

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$42,334.47
Expenditures for state aid road construction	27,950.80
Expenditures for state aid bridge construction	5,552.46
Total state aid expenditures	33,503.26
Balance available for 1918	8,831.21
Total appropriation for 1918 road and bridge construction	36,959.29
Amount available 1918	45,790.50



FIG. 1. A daily occurrence when operating a grader on heavy, rough work.



FIG. 2. A well maintained earth road on Trunk Highway No. 39, Oneida County.



FIG. 3. A well maintained 15 ft. gravel surface on Trunk Highway No. 10, between Woodruff and Minocqua, Oneida County. Note the concrete retaining wall protecting the road from the waves of the lake.

ONEIDA COUNTY

Oneida County has pushed very rapidly ahead during the last two years. Starting very slowly the road movement has gained momentum until this county ranks very high among the good roads counties.

A bond issue of \$140,000.00, available in 1917, has produced large amounts of work both in 1917 and 1918. The work is very well done and the maintenance this year has been very good.

All in all this county ranks with the best of the northern counties, which means the best in Wisconsin.

ONEIDA COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$860.71; Local, \$10,-	
100.00; County, \$37,616.13; State, \$3,324.30; Ad-	
vanced, \$6,778.93; Other, \$2,390.61; Total	\$59,349.26
Net amount transferred to bridge fund	2,003.47
Net total available for road construction	57,345.79
Mileage: Graded and surfaced, 4.00 miles; Surfaced not	
graded, 0.68 miles; Graded not surfaced, 24.06 miles;	
Total, 28.74 miles; Approximate number roads built,	
29	
Grading: 28.06 miles at \$1,022 per mile; 93,486 cu. yds.	
earth moved at 31 cts. per cu. yd.; average excava-	
tion per mile, 3,330 cu. yds.	28,674.33
Culverts: 18 conc. culverts; 155.9 cu. yds. conc. at \$8.09	
per cu. yd.	1,258.16
26 metal culverts; 5 culverts repaired	676.05
Total cost per mile of all culverts, \$69	
Surfacing: (Cost per mile given is based on 9 ft. width	
of surfacing)	
Nonpermanent types of surfacings; 1.04 miles at	1,281.68
Crushed stone: 0.42 miles; 4,690 sq. yds.	3,587.44
Pit run gravel: 3.22 miles at \$756; 21,148 sq. yds. at	
14 cts.	3,026.43
Top dressing and miscellaneous	1,976.09
Miscellaneous Items:	
Right of way purchased	290.00
Clearing and grubbing	7,604.60
Tile underdrain	5.00
Guard rail: 7,449 lin. ft. at 19 cts. per lin. ft.	1,431.72
Ditching and draining	2,348.44
Miscellaneous	2,893.10
Total cost per mile of all miscellaneous items, \$519	
Total expenditures for 1916 road construction	55,053.04
Payments on road construction of preceding years..	413.34
Total road disbursements 1916	55,466.38
Deficit (after deducting advances)	4,899.52
Miscellaneous payments on contracts previously re-	
ported	801.66
Deficit carried forward	5,701.18



FIG. 1. One of Outagamie County's 16 ft. concrete roads. This county now has sixty-five miles of well built concrete highway and will build twenty-five miles in 1919.



FIG. 2. A high-class structure of modern design and first-class workmanship. The span is 50 ft., the roadway 20 ft. This bridge was necessary in a relocation made to correct bad alignment on an important road. The old stone arch bridge was in good condition, but useless because of improper location.



FIG. 3. The Appleton City motorized fire department on State Trunk Highway No. 47. Good roads will make adequate rural fire protection possible.

ONEIDA COUNTY**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1915, \$171.84; Local, \$1,-	
500.00; County, \$1,883.88; State, \$366.15; Total ..	\$3,921.87
Net amount transferred from road fund	2,003.47
Net total available for bridge construction	5,925.34
Steel I-beam bridges: No. built, 4; Total length, 82 ft.;	
containing 180.1 cu. yds. concrete; 26,740 lbs. steel;	
cost per ft., \$28.00	
Total No. bridges built, 4; Total length, 82 ft.; Total ex-	
penditures	2,296.00
Balance carried forward	3,629.34

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$5,701.18; Local, \$17,-	
175.00; County, \$19,825.00; State, \$3,702.39; Other,	
\$2,401.82; Bonds, \$137,021.70; Total	\$174,424.73
Mileage: Graded and surfaced, 2.57 miles; Surfaced not	
graded, 1.07 miles; Graded not surfaced, 39.01	
miles; Total, 42.65 miles; Approximate number roads	
built, 31	
Grading: 41.58 miles at 1,120 per mile; 156,500 cu. yds.	
earth moved at 30 cts. per cu. yd.; average excava-	
tion per mile, 3,766 cu. yds.	46,549.60
Culverts: 24 conc. culverts; 219.3 cu. yds. conc. at \$11.62	
per cu. yd.	2,545.91
16 metal culverts; 5 culverts repaired	749.72
Total cost per mile of all culverts, \$79	
Surfacing: (Cost per mile given is based on 9 ft. width	
of surfacing)	
Nonpermanent types of surfacings	2,412.85
Pit run gravel: 3.64 miles at \$1,153; 19,406 sq. yds at	
22 cts.	4,601.14
Miscellaneous Items:	
Right of way purchased	771.50
Clearing and grubbing	12,833.66
Guard rail: 2,953 lin. ft. at 19 cts. per lin. ft.	571.95
Ditching and draining	1,832.02
Miscellaneous	352.29
Total cost per mile of all miscellaneous items, \$393	
Total expenditures for 1917 road construction	73,220.14
Balance carried forward	101,204.59

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916: \$3,629.34; Total	\$3,629.34
Steel I-beam bridges: No. built, 3; Total length, 88 ft.;	
containing 143.7 cu. yds. concrete; 34,890 lbs. steel;	
cost per ft., \$26.30	
Total No. bridges built, 3; Total length, 88 ft.; Total ex-	
penditures	2,315.00
Balance carried forward	1,314.34

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917	\$178,054.07
Expenditures for state aid road construction	73,220.14
Expenditures for state aid bridge construction	2,315.00
Total state aid expenditures	75,535.14
Balance available for 1918	102,518.93
Total appropriation for 1918 road and bridge construction	22,076.95
Amount available 1918	124,595.88

OUTAGAMIE COUNTY

This county has been another astonishing surprise in the development of road sentiment. Starting work very reluctantly and with moderately small amounts, a few of the prominent citizens in the county interested in roads have developed the county into one of the best good roads counties in the state.

In the spring of 1916, by vote of the electors, the county was bonded for \$700,000.00 for the construction of a system of concrete roads. Due to the increasing prices the amount of road secured by this bond issue was much less than contemplated. In the fall of 1917 the county board bonded the county for \$260,000.00 in addition, and it is expected that further bond issues will be made as it becomes possible to prosecute the work.

The county has built about 40 miles of concrete road under the original bond issue. The construction has been excellent, probably averaging better than the concrete roads in any of the Wisconsin counties. This has been due to the excellent local supervision and to the lessons learned from other counties. The county is now well on its way to securing a system of roads second only to that of Milwaukee County, which considering its comparatively small valuation and the high prices is a remarkable result, especially when sentiment in 1912 and 1913 is considered.

The maintenance in 1918 has been somewhat disappointing and is not up to the standard of the counties construction operations.

OUTAGAMIE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$11,353.89; Local, \$14,100.00; County, \$14,100.00; State, \$14,900.00; Bond issue, \$305,025.00; Other, \$240.00; Total \$359,718.89

Mileage: Graded and surfaced, 16.29 miles; Surfaced not graded, 9.36 miles; Graded not surfaced, 3.37 miles; Total, 20.02 miles; Approximate number roads built, 15

OUTAGAMIE COUNTY

Grading: 19.66 miles at \$1,120 per mile; 51,110 cu. yds. earth moved at 43 cts. per cu. yd.; average excavation per mile, 2,600 cu. yds.	\$22,045.51
Culverts: 53 con. culverts; 842.8 cu. yds. conc. at \$9.28 per cu. yd.	8,158.48
Total cost per mile of all culverts, \$415	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 3.18 miles at \$2,828; 16,800 sq. yds. at 53 cts.	8,986.89
Concrete: 13.47 miles at \$8,320; 112,493 sq. yds. at \$1.58	177,118.07
Miscellaneous Items:	
Clearing and grubbing	65.00
Miscellaneous	1,099.01
Total cost per mile of all miscellaneous items, \$59	
Total expenditures for 1916 road construction	217,472.96
Balance carried forward	142,245.93

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1915, \$1,694.39; Local, \$2,100.00; County, \$2,100.00; State, \$2,107.00; Total	\$4,605.61
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 8 ft.; containing, 105.1 cu. yds. concrete; 1,600 lbs. steel; cost per ft., \$162.25; per cu. yd., \$12.35	
Total No. bridges built, 1; Total length, 8 ft.; total expenditures	1,298.12
Balance carried forward	3,307.49

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$142,245.93; County, \$26,577.42; State, \$17,718.28; Other, \$35,573.51; Bonds, \$355,453.83; Total	\$577,568.97
Net amount transferred to bridge fund	3,155.20
Net total available for road construction	574,413.77
Mileage: Graded and surfaced, 16.33 miles; Surfaced not Graded, 3.26 miles; Graded not surfaced, 5.01 miles; Total, 24.60 miles; Approximate number roads built, 18	
Grading: 21.34 miles at \$1,101 per mile; 36,565 cu. yds. earth moved at 60 cts. per cu. yd.; average excavation per mile, 1,710 cu. yds.	23,629.76
Culverts: 112 conc. culverts; 1,492.4 cu. yds. conc. at \$6.85 per cu. yd.	10,215.68
Total cost per mile of all culverts, \$479	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 1.78 miles at \$2,690; 9,400 sq. yds. at 51 cts.	4,780.44
Concrete: 17.81 miles at \$10,270; 141,684 sq. yds. at \$1.94	274,912.27
Shoulders to concrete road	1,137.42



FIG. 1. A 9 ft. concrete road with earth shoulders on Trunk Highway No. 17, Outagamie County. Note the fine farm buildings and concrete silos.



FIG. 2. Milk hauling vehicles on Trunk Highway No. 47, Outagamie County.



FIG. 3. Outagamie County maintenance truck delivering shoulder material on a 9-ft. concrete road.

OUTAGAMIE COUNTY**Miscellaneous Items:**

Tile underdrain	\$213.91
Curb and gutter	218.88
Guard rail: 1,421 lin. ft. at 26 cts. per lin. ft.	375.52
Ditching and draining	68.08
Inspection	3,884.00
Miscellaneous	9,023.66
Total cost per mile of all miscellaneous items, \$646	
Total expenditures for 1917 road construction	328,459.62
Balance carried forward	245,954.15

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$3,307.49; Total	\$3,307.49
Net amount transferred from road fund	3,155.20
Net total available for bridge construction	6,462.69
Reinforced concrete slab and girder bridges: No. built, 1;	
Total length, 18 ft.; containing, 80.2 cu. yds. concrete; 4,860 lbs. steel; cost per ft., \$92.90; per cu. yd., \$20.85	
Total No. bridges built, 1; Total length, 18 ft.; total expenditures	1,672.00
Balance carried forward	4,790.69

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$580,876.46
Expenditures for state aid road construction	328,459.62
Expenditures for state aid bridge construction	1,672.00
Total state aid expenditures	330,131.62
Balance available for 1918	250,744.84
Total appropriation for 1918 road and bridge construction	115,054.89
Amount available 1918	365,799.73

OZAUKEE COUNTY

Progress in this county continues slow with the exception of one or two sections. The people have supported the road movement very conservatively, but a better feeling is manifested and quicker results may be expected when normal times return.

The construction work has been good and maintenance fair. We are not discouraged with the outlook in this county.

OZAUKEE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$1,254.11; Local, \$7,500.00; county, \$7,500.00; State, \$7,044.60; Advanced, \$2,250.00; Other, \$1,828.90; Total	\$24,869.39
Mileage: Graded and surfaced, 3.95 miles; Surfaced not graded, 0.26 miles; Total, 4.21 miles; Approximate number roads built, 8	
Grading: 3.95 miles at \$874 per mile; 10,322 cu. yds. earth moved at 33 cts. per cu. yd.; average excavation per mile, 2,610 cu. yds.	3,454.89
Culverts: 23 conc. culverts; 217.5 cu. yds. conc. at \$8.20 per cu. yd.	1,783.76
Total cost per mile of all culverts, \$451	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 2.92 miles at \$2,190; 26,449 sq. yds. at 40 cts.	10,495.02
Crushed gravel: 1.29 miles at \$2,180; 8,600 sq. yds. at 41 cts.	3,551.78
Road oil	95.93
Miscellaneous Items:	
Clearing and grubbing	25.75
Total cost per mile of all miscellaneous items, \$6	
Total expenditures for 1916 road construction	19,407.13
Balance carried forward (after deducting advances) ..	3,212.26

NO 1916 STATE AID BRIDGE CONSTRUCTION

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$3,212.26; Local, \$9,150.00; County, \$9,150.00; State, \$7,202.65; Advanced, \$800.00; Other, \$1,166.09; Total	\$30,681.00
Net amount transferred to bridge fund	368.40
Net total available for road construction	30,312.60
Mileage: Graded and surfaced, 3.50 miles; Total 3.50 miles; Approximate number roads built, 4	

OZAUKEE COUNTY

Grading: 3.50 miles at \$1,165 per mile; 11,054 cu. yds. earth moved at 37 cts per cu. yd.; average excavation per mile, 3,150 cu. yds.	\$4,080.59
Culverts: 12 conc. culverts; 115.6 cu. yds. conc. at \$10.60 per cu. yd.	1,226.09
2 metal culverts	355.69
Total cost per mile of all culverts, \$452	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 3.50 miles at \$2,850; 28,652 sq. yds. at 54 cts.	15,453.23
Miscellaneous Items:	
Clearing and grubbing	115.01
Tile underdrain	80.91
Guard rail: 1,508 lin. ft. at 22 cts per lin. ft.	329.52
Ditching and draining	29.80
Miscellaneous	378.78
Total cost per mile of all miscellaneous items, \$267	
Total expenditures for 1917 road construction	22,049.62
Balance carried forward (after deducting advances) ..	7,462.98

1917 STATE AID BRIDGE CONSTRUCTION

Net amount transferred from road fund	\$368.40
Net total available for bridge construction	368.40
Reinforced concrete slab and girder bridges: No. built 1; Total length, 10 ft.; containing, 43.7 cu. yds. concrete; 2,020 lbs. steel; cost per ft., \$36.85; per cu. yd., \$8.45	
Total number of bridges built, 1; Total length, 10 ft.;	
Total expenditures	368.40

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$30,681.00
Expenditures for state aid road construction	22,049.62
Expenditures for state aid bridge construction	368.40
Total state aid expenditures	22,418.02
Balance available for 1918 (after deducting advances of \$800.00)	7,462.98
Total appropriation for 1918 road and bridge construction	35,590.90
Amount available 1918	43,053.88

PEPIN COUNTY

Much excellent work has been done in this county, which is unfavorably situated both as to valuation and materials available. All in all construction, maintenance, and the general situation must be considered as excellent in this county.

PEPIN COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$970.43; Local, \$2,-900.00; County, \$3,516.70; State, \$2,283.30; Other, \$11.17; Total	\$9,681.60
Net amount transferred from bridge fund	52.00
Net total available for road construction	9,733.60
Mileage: Graded and surfaced, 2.30 miles; Surfaced not graded, 0.10 miles; Graded not surfaced, 0.84 miles; Total, 3.24 miles; Approximate number roads built, 5	
Grading: 3.14 miles at \$997 per mile; 17,505 cu. yds. earth moved at 18 cts. per cu. yd.; average excavation per mile, 5,570 cu. yds.	3,133.45
Culverts: 8 conc. culverts; 126.0 cu. yds. conc. at \$8.06 per cu. yd.	1,015.03
2 metal culverts	112.08
Total cost per mile of all culverts, \$359	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 2.40 miles at \$1,164; 16,871 sq. yds. at 22 cts.	3,711.39
Miscellaneous Items:	
Right of way purchased	10.00
Clearing and grubbing	64.00
Guard rail: 77 lin. ft. at 23 cts. per lin ft.	17.53
Miscellaneous	131.90
Total cost per mile of all miscellaneous items, \$71	
Total expenditures for 1916 road construction	8,195.38
Payments on road construction of preceding years ...	363.92
Total road disbursements 1916	8,559.30
Balance carried forward	1,174.30

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$377.33; Total	\$377.33
Net amount transferred to road fund	52.00
Net total available for bridge construction	325.33
Reinforced concrete slab and girder bridges: No. built 2; Total length, 18 ft.; containing 142.5 cu. yds. concrete; 4,620 lbs. steel; cost per ft., \$78.70; per cu. yd., \$9.95	1,417.00
Steel I-beam bridges: No. built, 1; Total length, 30 ft.; containing 91.4 cu. yds. concrete; 12,270 lbs. steel; cost per ft., \$65.00	1,948.00
Total No. bridges built, 3; Total length, 48 ft.; Total expenditures	3,365.00
Deficit carried forward	3,039.67

PEPIN COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$1,174.30; Local, \$5,-400.00; County, \$8,334.23; State, \$2,465.77; Total..	\$17,374.30
Mileage: Graded and surfaced, 4.73 miles; Graded not surfaced, 0.52 miles; Total, 5.25 miles; Approximate number roads built, 9	
Grading: 5.25 miles at \$1,264 per mile; 48,300 cu. yds. earth moved at 16 cts. per cu. yd., average excavation per mile, 9,200 cu. yds.	7,554.05
Culverts: 6 conc. culverts; 49.9 cu. yds. conc. at \$12.75 per cu. yd.	636.80
10 metal culverts	674.49
Total cost per mile of all culverts, \$250	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 0.57 miles	1,005.38
Pit run gravel: 4.15 miles at \$789; 25,204 sq. yds. at 15 cts.	3,860.40
Oil: 752 sq. yds. at 10 cts.	75.04
Miscellaneous Items:	
Right of way purchased	815.00
Clearing and grubbing	428.25
Guard rail: 822 lin. ft. at 28 cts. per lin. ft.	231.93
Total cost per mile of all miscellaneous items, \$281	
Total expenditures for 1917 road construction	15,281.34
Balance carried forward	2,092.96

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$3,039.67; Total deficit..	\$3,039.67
Deficit carried forward	3,039.67

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$14,334.63
Expenditures for state aid road construction	15,281.34
Total state aid expenditures	15,281.34
Deficit for 1918	946.71
Total appropriation for 1918 road and bridge construction	16,356.34
Amount available 1918	15,409.63

PIERCE COUNTY

Pierce County has gone ahead at a moderate speed and has done a considerable amount of excellent work under difficult conditions. Sentiment has improved materially and with the support work is now getting, rapid advancement may be expected in this county. The maintenance work is good.

PIERCE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$3,717.17; Local, \$9,600.00; County, \$9,600.00; State, \$4,175.73; Advanced, \$1,092.67; Other, \$329.46; Total	\$28,515.03
Net amount transferred from bridge fund	3,074.09
Net total available for road construction	31,589.12
Mileage. Graded and surfaced, 2.81 miles; Surfaced not graded, 1.55 miles; Graded not surfaced, 9.22 miles; Total, 13.58 miles; Approximate number of roads built 24	
Grading: 12.03 miles at \$1,246 per mile; 58,300 cu. yds. earth moved at 27 cts. per cu. yd.; average excavation per mile, 4,850 cu. yds.	15,566.17
Culverts: 28 conc. culverts; 317.7 cu. yds. conc. at \$7.99 per cu. yd.	2,528.00
22 metal culverts	831.67
Total cost per mile of all culverts, \$279	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 0.92 miles at \$853 per mile	785.95
Pit run gravel; 3.34 miles at \$1,135; 19,904 sq. yds. at 21 cts	4,263.90
Concrete: 0.10 miles at \$8,830; 1,065 sq. yds. at \$1.66	1,767.90
Miscellaneous Items:	
Right of way purchased	325.00
Clearing and grubbing	382.82
Guard rail: 912 lin. ft. at 13 cts. per lin. ft.	116.64
Miscellaneous	1,400.51
Total cost per mile of all miscellaneous items, \$185	
Total expenditures for 1916 road construction	27,968.56
Payments on road construction of preceding years	596.03
Total road disbursements 1916	28,564.59
Balance carried forward (after deducting advances) ..	1,931.86

PIERCE COUNTY**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1915, \$1,522.25; Local, \$6,-	
270.00; County, \$6,270.00; State, \$2,727.27; Total,...	\$16,789.53
Net amount transferred to road fund	3,074.09
Net total available for bridge construction	13,715.42
Reinforced concrete slab and girder bridges: No. built,	
2; Total length, 22 ft., containing 118.2 cu. yds. con-	
crete; 3,930 lbs. steel; cost per ft., \$71.10; per cu.	
yd., \$13.25	1,565.88
Reinforced concrete arch bridges: No. built, 1; Total	
length, 16 ft., containing 182.5 cu. yds. concrete;	
7,640 lbs. steel; cost per ft., \$117.65; per cu. yd.,	
\$10.30	1,882.10
Steel I-beam bridges: No. built, 9; Total length, 210 ft.;	
containing 589.0 cu. yds. concrete; 80,690 lbs. steel;	
cost per ft., \$37.95	7,967.03
Total No. of bridges built: 12; Total length, 248 ft.; Total	
expenditures	11,415.01
Balance carried forward	2,300.42

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$1,931.86; Local, \$10,-	
375.00; County, \$10,375.00; State, \$4,499.86; Other,	
\$10.12; Total	\$27,191.84
Net amount transferred from bridge fund	608.72
Net total available for road construction	27,800.56
Mileage: Graded and surfaced, 4.17 miles; Surfaced not	
graded, 4.84 miles; Graded not surfaced, 3.26 miles;	
Total, 12.27 miles; Approximate number roads built,	
20	
Grading: 7.43 miles at \$1,126 per mile; 28,334 cu. yds.	
earth moved at 30 cts. per cu. yd.; average excava-	
tion per mile, 3,815 cu. yds.	9,879.29
Culverts: 22 conc. culverts; 252.8 cu. yds. conc. at \$9.40	
per cu. yd.	2,375.64
Metal culverts	170.20
Total cost per mile of all culverts, \$343	
Surfacing: (Cost per mile given is based on 9 ft. width	
of surfacing)	
Pit run gravel: 9.01 miles at \$763; 47,638 sq. yds. at	
15 cts.	6,873.83
Miscellaneous Items:	
Right of way purchased	10.00
Clearing and grubbing	141.35
Guard rail: 1,044 lin. ft. at 28 cts per lin. ft.	293.02
Miscellaneous	358.00
Total cost per mile of all miscellaneous items, \$108	
Total expenditures for 1917 road construction	20,101.33
Balance carried forward	7,699.23



FIG. 1. A view on the Plum City-Ellsworth Road, State Trunk Highway No. 34, Pierce County.



FIG. 2. A steel bridge on State Trunk Highway No. 45 built jointly by three units, the Town of Trenton, Pierce County and the State. (See description, pp. 14 and 15) An excellent example of steel bridge construction.



FIG. 3. A well maintained earth road in Polk County. The soil in Polk County is such that it is possible to maintain an excellent earth road at a

PIERCE COUNTY**1917 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1916, \$2,300.42; Local, \$6,-	
655.00; County, \$6,655.00; State, \$2,886.43; Total	\$18,496.85
Net amount transferred to road fund	608.72
Net total available for bridge construction	17,888.13
Reinforced concrete slab and girder bridges: No. built,	
3; Total length, 45 ft.; containing 221.6 cu. yds. concrete;	
14,580 lbs. steel; cost per ft., \$93.95; per cu. yd. \$19.10	4,228.20
Reinforced concrete arch bridges: No. built, 1; Total	
length, 10 ft.; containing 100.0 cu. yds. concrete;	
2,530 lbs. steel; cost per ft., \$138.20; per cu. yd., \$13.80	1,382.00
Steel I-beam bridges: No. built, 1; Total length, 30 ft.;	
containing 109.1 cu. yds. concrete; 12,270 lbs steel;	
cost per ft., \$46.80	1,404.40
Steel truss bridges: No. built, 1; Total length, 45 ft.; containing	
169.5 cu. yds. concrete; 24,440 lbs. steel; cost per ft., \$77.75	3,500.00
Total No. bridges built, 6; Total length, 130 ft.; Total	
expenditures	10,514.60
Balance carried forward	7,373.53

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$45,688.69
Expenditures for state aid road construction	20,101.33
Expenditures for state aid bridge construction	10,514.60
Total state aid expenditures	30,615.93
Balance available for 1918	15,072.76
Total appropriation for 1918 road and bridge construction	18,661.35
Amount available 1918	33,734.11

POLK COUNTY

Polk County is now one of the leading good roads counties in northwestern Wisconsin. Mr. McLean, county highway commissioner, now with the State Highway Commission, produced a rapid change in sentiment and results in this county, and with the start that has been made and the good support now given the work by the board and county committee, there is no reason why this progress should not be continued.

General conditions both as to construction, maintenance and public sentiment are encouraging.

POLK COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$1,905.57; County, \$34,981.95; State, \$7,018.05; Other, \$2,864.11; Total	\$46,769.68
Net amount transferred to bridge fund	164.61
Net total available for road construction	46,605.07
Mileage: Graded and surfaced, 6.47 miles; Surfaced not graded, 2.75 miles; Graded not surfaced, 11.27 miles; Total, 18.49 miles; Approximate number roads built, 13	
Grading: 17.74 miles at \$1,378 per mile; 82,454 cu. yds. earth moved at 29 cts. per cu. yd.; average excavation per mile, 4,650 cu. yds.	24,452.72
Culverts: 48 conc. culverts; 558.9 cu. yds. conc. at \$5.30 per cu. yd.	2,963.92
3 metal culverts	102.10
Total cost per mile of all culverts, \$173	
Surfacing: (Cost per mile given is based on 9 ft width of surfacing)	
Nonpermanent types of surfacings: 0.28 miles at \$329 per mile	154.50.
Pit run gravel: 6.94 miles at \$807; 36,976 sq. yds. at 15 cts.	5,649.84
Miscellaneous Items:	
Right of way purchased	950.00
Clearing and grubbing	1,462.37
Tile underdrain	80.00
Guard rail: 4,109 lin. ft. at 25 cts. per lin. ft.	1,028.71
Ditching and draining	374.44
Miscellaneous	529.03
Total cost per mile of all miscellaneous items, \$249	
Total expenditures for 1916 road construction	37,747.63
Payments on road construction of preceding years ...	1,030.04
Total road disbursements 1916	38,777.67
Balance	7,827.40
Returned to maintenance fund	677.01
Balance carried forward	7,150.39

POLK COUNTY**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1915, \$931.77; Total	\$931.77
Net amount transferred from road fund	164.61
Net total available for bridge construction	1, 096.38
Steel I-beam bridges: No. built, 2; Total length, 42 ft.; containing 170.8 cu. yds. concrete; 14,390 lbs. steel; cost per ft., \$35.85	
Total No. bridges built, 2; Total length, 42 ft.; total expenditures	1, 577.00
Deficit carried forward	410.62

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$7,150.39; County, \$40,263.79; State, \$7,761.65; Other, \$2,372.20	
Total	\$57, 548.03
Net amount transferred to bridge fund	802.71
Net total available for road construction	56, 745.32
Mileage: Graded and surfaced, 9.11 miles; Surfaced not graded, 2.48 miles; Graded not surfaced, 7.24 miles; Total, 18.83 miles; Approximate number roads built, 13	
Grading: 16.35 miles at \$1,500 per mile; 72,095 cu. yds. earth moved at 34 cts. per cu. yd.; average excavation per mile, 4,440 cu. yds.	24, 517.52
Culverts: 29 conc. culverts; 308.4 cu. yds. conc. at \$7.27 per cu. yd.	2, 241.69
2 metal culverts	172.03
Total cost per mile of all culverts, \$148	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 9.45 miles at \$805 per mile	7, 689.96
Pit run gravel: 2.14 miles at \$1,076; 11,300 sq. yds. at 19 cts.	2, 155.07
Miscellaneous Items:	
Right of way purchased	362.60
Clearing and grubbing	1, 196.49
Tile underdrain	235.75
Ditching and draining	79.25
Total cost per mile of all miscellaneous items, \$114	
Total expenditures for 1917 road construction	38, 650.36
Balance carried forward	18, 094.96

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$410.62; Total deficit	\$410.62
Net amount transferred from road fund	802.71
Net total available for bridge construction	392.09
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 40 ft.; containing, 186.9 cu. yds. concrete; 9,650 lbs. steel; cost per ft., \$42.10; per cu. yd., \$9.10	1, 682.74
Steel I-beam bridges: No. built, 1; Total length, 22 ft.; containing 41.6 cu. yds. concrete; 8,760 lbs. steel; cost per ft., \$27.29	597.75
Total No. bridges built, 4; Total length, 62 ft.; total expenditures	2, 280.49
Deficit carried forward	1, 888.40

POLK COUNTY

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917	\$57,137.41
Expenditures for state aid road construction	38,650.36
Expenditures for state aid bridge construction	2,280.49
Total state aid expenditures	40,930.85
Balance available for 1918	16,206.56
Total appropriation for 1918 road and bridge construction	20,280.64
Amount available 1918	36,487.20

PORTAGE COUNTY

This county has maintained its position as one of the leading good roads counties in central Wisconsin. Like all of the counties older in the road game, the maintenance problem has become acute, and to it is devoted a considerable share of the attention of the county organization.

The construction is good, and the maintenance fair. It is probable that larger maintenance appropriations will have to be made available if the county is to maintain its roads under the very heavy traffic. One of the main east and west roads, and probably the most important north and south road on the State Trunk Highway System, pass through this county, and the problem their maintenance imposes upon the county is very severe.

PORTAGE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$5,023.26; Local, \$14,-250.00; County, \$14,250.00; State, \$6,959.62; Advanced, \$4,757.84; Other, \$27.68; Total	\$45,268.40
Mileage: Graded and surfaced, 11.51 miles; Surfaced not graded, 3.80 miles; Graded not surfaced, 4.12 miles; Total, 19.43 miles; Approximate number roads built, 21	
Grading: 15.63 miles at \$434 per mile; 24,770 cu. yds. earth moved at 27 cts. per cu. yd.; average excavation per mile, 1,580 cu. yds.	6,791.13
Culverts: 15 conc. culverts; 155.9 cu. yds. conc. at \$8.92 per cu. yd.	1,390.16
Total cost per mile of all culverts, \$89	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 5.95 miles at \$2,060; 31,436 sq. yds. at 39 cts.	12,236.02
Crushed gravel: 9.36 miles at \$1,468; 49,400 sq. yds. at 28 cts.	14,402.06

PORTAGE COUNTY**Miscellaneous Items:**

Right of way purchased	\$31.60
Clearing and grubbing	259.38
Tile underdrain	82.00
Guard rail: 464 lin. ft. at 22 cts. per lin. ft.	102.94
Miscellaneous	85.28
Total cost per mile of all miscellaneous items, \$36	
Total expenditures for 1916 road construction	35,380.62
Balance (after deducting advances)	5,129.94
Paid to town	31.50
Balance carried forward	5,098.44

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$5,523.20; Local, \$1,- 950.00; County, \$1,950.00; State, \$952.28; Total	\$10,375.48
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 8 ft.; containing 32.0 cu. yds. con- crete; 1,680 lbs. steel; cost per ft., \$63.60; per cu. yd., \$15.90	508.95
Steel I-beam bridges: No. built, 5; Total length, 103 ft.; containing 224.3 cu. yds. concrete; 29,790 lbs. steel; cost per ft., \$33.50	3,450.62
Steel plate girder bridges: No. built, 1; Total length, 50 ft., containing 109.5 cu. yds. concrete; 22,040 lbs. steel; cost per ft., \$37.30;	1,863.00
Total No. bridges built, 7; Total length, 161 ft.; Total ex- penditures	5,822.57
Balance carried forward	4,552.91

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$5,098.44; County, \$25,- 097.06; State, \$8,402.94; Advanced, \$600.00; Other, \$14,153.79; Total	\$53,352.23
Net amount transferred from bridge fund	39.12
Net total available for road construction	53,391.35
Mileage: Graded and surfaced, 4.07 miles; Surfaced not graded, 1.60 miles; Graded not surfaced, 4.67 miles; Total, 10.34 miles; Approximate number roads built, 11	
Grading: 8.74 miles at \$890 per mile; 22,045 cu. yds. earth moved at 35 cts per cu. yd.; average excava- tion per mile, 2,520 cu. yds.	7,788.82
Culverts: 11 conc. culverts; 123.7 cu. yds. conc. at \$10.86 per cu. yd.	1,343.03
1 metal culvert	20.00
Total cost per mile of all culverts, \$156	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 4.53 miles at \$2,700; 25,790 sq. yds. at 51 cts.	13,821.23
Pit run gravel: 1.14 miles at \$800; 6,050 sq. yds. at 15 cts.	912.32



FIG. 1. A relocation in Portage County, surfaced with stone macadam and later re-surfaced with fine gravel.



FIG. 2. A well maintained stone macadam road on State Trunk Highway No. 10 in Portage County.



FIG. 3. Portable wooden stave oil storage tanks designed by Thomas E. Cauley, County Highway Commissioner of Portage County. They are moved by motor truck to the car tracks and placed on the ground as shown in the picture. The tank cars are unloaded into the wooden tanks and the oil is used when needed, thereby saving many dollars in demurrage and charges for car service.

PORTAGE COUNTY

Miscellaneous Items:

Right of way purchased	\$15.00
Clearing and grubbing	237.88
Tile underdrain	98.70
Guard rail	32.95
Ditching and draining	109.94
Miscellaneous	85.23
Total cost per mile of all miscellaneous items, \$660	
Total expenditures for 1917 road construction	24,465.10
Balance (after deducting advances)	28,326.25
Amount returned to local fund	74.17
Balance carried forward	28,252.08

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$4,552.91; Total	\$4,552.91
Net amount transferred to road fund	39.12
Net total available for bridge construction	4,513.79
Balance carried forward	4,513.79

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$57,830.97
Expenditures for state aid road construction	24,465.10
Total state aid expenditures	24,465.10
Balance available for 1918	32,765.87
Total appropriation for 1918 road and bridge construction	33,528.35
Amount available 1918	66,294.22

PRICE COUNTY

Work in this county continues good and the maintenance is very good. Public sentiment has well supported the road movement and it is to be expected that this county will more than keep pace with neighboring counties.

PRICE COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$6,744.19; Local, \$12,-900.00; County, \$12,900.00; State, \$3,742.97; Advanced, \$3,041.94; Total	\$39,329.10
Mileage: Surfaced not graded, 102 miles; Graded not surfaced, 28.46; Total, 29.48 miles; Approximate number roads built, 20	
Grading: 28.46 miles at \$892 per mile; 66,465 cu. yds. earth moved at 38 cts. per cu. yd.; average excavation per mile, 2,330 cu. yds.	25,771.79
Culverts: 2 conc. culverts; 30.7 cu. yds. conc. at \$8.28 per cu. yd.	254.49
2 metal culverts; 17 wood culverts	181.95
Total cost per mile of all culverts, \$153	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 1.02 miles at \$826; 7,560 sq. yds. at 15 cts	3,791.45
Miscellaneous Items:	
Clearing and grubbing	3,503.94
Tile under drain	28.38
Guard rail: 700 lin. ft. at 9 cts per lin. ft.	65.63
Ditching and draining	2,525.51
Miscellaneous	12.60
Total cost per mile of all miscellaneous items, \$215	
Total expenditures for 1916 road construction	36,135.74
Balance carried forward (after deducting advances) ..	151.42

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$581.76; Local, \$1,100.-00; County, \$1,100.00; State, \$319.18; Total	\$3,100.94
Steel I-beam bridges: No. built, 2; Total length, 46 ft.; containing 71.2 cu. yds. concrete; 17,080 lbs. steel; cost per ft., \$22.40	
Total No. bridges built, 2; Total length, 46 ft.; Total expenditures	1,029.99
Balance carried forward	2,070.95

PRICE COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$151.42; Local, \$13,-	
400.00; County, \$13,400.00; State, \$4,220.71; Ad-	
vanced, \$7,274.51; Other, \$916.45; Total	\$39,363.09
Net amount transferred from bridge fund	374.84
Net total available for road construction	39,737.93
Mileage: Graded and surfaced, 1.22 miles; Surfaced not	
graded, 0.68 miles; Graded not surfaced, 22.37 miles;	
Total, 24.27 miles; Approximate number roads built,	
20	
Grading: 23.59 miles at \$1,000 per mile; 60,630 cu. yds.	
earth moved at 39 cts. per cu. yd.; average excava-	
tion per mile, 2,570 cu. yds.	22,914.75
Culverts: 24 conc. culverts; 251.5 cu. yds. conc. at \$9.72	
per cu. yd.	2,443.69
9 wood culverts	189.40
Total cost per mile of all culverts, \$117.	
Surfacing: (Cost per mile given is based on 9 ft. width	
of surfacing)	
Pit run gravel: 190 miles at \$1,130; 17,993 sq. yds.	
at 21 cts.	3,857.19
Miscellaneous Items:	
Clearing and grubbing	3,124.70
Ditching and draining	784.40
Total cost per mile of all miscellaneous items, \$165	
Total expenditures for 1917 road construction	34,314.13
Deficit carried forward (after deducting advances)....	1,850.71

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$2,070.95; Local, \$500.00;	
County, \$500.00; State, \$157.60; Total	\$3,228.55
Net amount transferred to road fund	374.84
Net total available for bridge construction	2,853.71
Steel I-beam bridges: No. built, 3; Total length, 60 ft.;	
containing 95.1 cu. yds. concrete; 17,690 lbs. steel;	
cost per ft., \$25.80	
Total No. bridges built, 3; Total length, 60 ft.; Total ex-	
penditures	1,546.13
Balance carried forward	1,307.58

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917 ..	\$42,591.64
Expenditures for state aid road construction	34,314.13
Expenditures for state aid bridge construction	1,546.13
Total state aid expenditures	35,860.26
Deficit for 1918 (after deducting advances of \$7,274.51)	543.13
Total appropriation for 1918 road and bridge construction	23,955.82
Amount available 1918	23,412.69



FIG. 1. One of Price County's many well maintained earth roads.



FIG. 2. A shale surfaced road with gravel top dressing on Trunk Highway No. 34, Pepin County. The road was built in 1916 and has given excellent satisfaction.



FIG. 3. An unusual structure in Richland County near Viola. This bridge is built to permit extreme floods to pass completely over the floor with the minimum of obstruction. The road on both sides of the bridge is paved with concrete which permits travel even when the road is overflowed and prevents damage.

RACINE COUNTY

This county started very slowly under the State Aid law but has recently made rapid strides. The board is giving excellent support to all road appropriations and the results, year by year, are becoming more effective. Travel in the county is very heavy and demands a higher type of surfacing than has been built in many cases. It is believed that the county will bond within a few years to hasten the construction of the type of road which it must have if it is to maintain them. The maintenance of the trunk highway system has been very well taken care of in 1918.

RACINE COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$8,861.97; Local, \$20,300.00; County, \$26,220.50; State, \$23,379.50; Advanced, \$33,666.67; Other, \$66.81; Total	\$112,495.45
Net amount transferred from bridge fund	118.01
Net total available for road construction	112,613.46
Mileage: Graded and surfaced, 10.24 miles; Surfaced not graded, 1.08 miles; Graded not surfaced, 0.43 miles; Total 11.75 miles; Approximate number roads built, 14	
Grading: 10.67 miles at \$1,073 per mile; 19,397 cu. yds. earth moved at 59 cts. per cu. yd.; average excavation per mile, 1,820 cu. yds.	11,468.70
Culverts: 40 conc. culverts; 415.3 cu. yds. conc. at \$9.94 per cu. yd.	4,126.63
Total cost per mile of all culverts, \$387	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone. 4.13 miles at \$4,560; 21,781 sq. yds. at 86 cts.	18,833.86
Crushed gravel: 2.19 miles at \$2,950; 11,557 sq. yds. at 56 cts.	6,447.84
Pit run gravel: 1.95 miles at \$2,830; 10,285 sq. yds. at 53 cts.	5,520.71
Concrete: 2.56 miles at \$6,970; 23,106 sq. yds. at \$1.32	30,547.68
Asphalt concrete: 0.49 miles at \$8,000; 3,800 sq. yds. at \$1.52	5,776.17
Miscellaneous Items:	
'Right of way purchased	25.00
Clearing and grubbing	230.43
Tile underdrain	1,600.81
Guard rail: 362 lin. ft. at 17 cts. per lin. ft.	61.64
Ditching and draining	6.40
Miscellaneous	470.96
Total cost per mile of all miscellaneous items, \$224	
Total expenditures for 1916 road construction	85,116.83
Deficit carried forward (after deducting advances) ..	6,170.04

RACINE COUNTY

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$1,006.69; Local, \$250.00;	
County, \$250.00; State, \$250.00; Total	\$1, 756.69
Net amount transferred to road fund	118.01
Net total available for bridge construction	1, 638.68
Reinforced concrete slab and girder bridges: No. built, 1;	
Total length, 12 ft.; containing, 55.9 cu. yds. concrete;	
1,620 lbs. steel; cost per ft., \$37.50; per cu. yd., \$8.05	449.69
Steel I-beam bridges: No. built, 1; Total length, 8 ft.; containing 65.0 cu. yds. concrete; 2,420 lbs. steel; cost per ft., \$92.15	737.75
Total No. bridges built, 2; Total length, 20 ft.; total expenditures	1, 187.44
Balance carried forward	451.24

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$6,170.04; Local, \$27,270.00; County, \$36,974.58; State, \$23,735.42; Advanced, \$26,666.67; Other, \$88.87; Total	\$108, 565.50
Net amount transferred from bridge fund	1, 729.65
Net total available for road construction	110, 295.15
Mileage: Graded and surfaced, 6.84 miles; Surfaced not graded, 9.30 miles; Graded not surfaced, 2.87 miles; Total 10.01 miles; Approximate number roads built 9	
Grading: 9.71 miles at \$1,580 per mile; 26,600 cu. yds. earth moved at 80 cts. per cu. yd.; average excavation per mile, 2,740 cu. yds.	21, 443.43
Culverts: 17 conc. culverts; 199.1 cu. yds. conc. at \$15.60 per cu. yd.	3, 728.55
Total cost per mile of all culverts, \$320	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.93 miles; 4,900 sq. yds.	7, 419.10
Crushed gravel: 4.00 miles at \$3,790; 21,105 sq. yds. at 70 cts.	24, 765.74
Concrete: 2.21 miles at \$8,876; 22,605 sq. yds. at \$1.67	38, 110.00
Shoulders to concrete road	457.25
Miscellaneous Items:	
Right of way purchased	335.00
Clearing and grubbing	181.70
Guard rail: 630 lin. ft. at 44 cts. per lin. ft.	490.35
Miscellaneous	688.87
Total cost per mile of all miscellaneous items, \$175	
Total expenditures for 1917 road construction	97, 619.99
Deficit carried forward (after deducting advances) ...	13, 991.51

1917 STATE AID BRIDGE CONSTRUCTION.

Funds Available: Balance 1916, \$451.24; Local, \$800.00;	
County, \$1,015.38; State, \$584.62; Total	\$2, 851.24
Net amount transferred to road fund	1, 729.65
Net total available for bridge construction	1, 121.59
Balance carried forward	1, 121.59

RACINE COUNTY—Continued
STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1918..	\$111,416.74
Expenditures for state aid road construction	97,619.99
Total state aid expenditures	97,619.99
Deficit for 1918 (after deducting advances of \$26,666.67)	12,869.92
Total appropriation for 1918 road and bridge construction	76,216.65
Amount available 1918	63,346.73

RICHLAND COUNTY

This county is laboring under great difficulties due to the very heavy narrow tired milk traffic and comparatively small appropriations.

The construction is good and maintenance excellent. The county board is doing its best to cope with a difficult situation and an extensive road program may be expected from this county at any time. In general the situation in this county may be considered as good.

RICHLAND COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$2,303.78; Local, \$900.00; County, \$20,900.00; State, \$6,200.33; Other, \$599.36; Total	\$30,903.47
Mileage: Graded and surfaced, 2.22 miles; Surfaced not graded, 1.58 miles; Graded not surfaced, 0.91 miles; Total, 3.71 miles; Approximate number roads built, 12	
Grading: 3.13 miles at \$1,490 per mile; 12,201 cu. yds. earth moved at 40 cts. per cu. yd.; average excavation per mile, 3,900 cu. yds.	4,885.29
Culverts: 18 conc. culverts; 266.0 cu. yds. conc. at \$9.83 per cu. yd.	2,917.02
Total cost per mile of all culverts, \$932	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 1.41 miles at \$4,500; 7,432 sq. yds. at 85 cts.	6,353.06
Pit run gravel: 1.20 miles at \$2,700; 6,320 sq. yds. at 51 cts.	3,246.60
Concrete: 1.16 miles at \$7,380; 10,452 sq. yds. at \$1.40	14,624.44
Concrete overflow: 0.03 miles; 302 sq. yds. at \$1.63...	494.32
Shoulders to concrete road	293.50
Miscellaneous Items:	
Right of way purchased	25.00
Guard rail: 7,475 lin. ft. at 29 cts. per lin. ft	2,176.68
Inspection	72.00
Riprap	289.03
Miscellaneous	49.77
Total cost per mile of all miscellaneous items, \$834	



FIG. 1. Pauls Hill, Richland county, getting the first spring dragging. Note the rut near the center of the road.



FIG. 2. The same section of Pauls Hill after having been properly dragged, the ditches cleaned out, and the bank slopes properly taken care of.



FIG. 3. A Minnesota Road Planer at work pulled by a combination Ford truck. This type of road planer has given excellent results on earth and gravel road maintenance.

RICHLAND COUNTY

Total expenditures for 1916 road construction	\$35,426.71
Deficit	4,523.24
Payments made on 1915 contracts reported in 1915...	559.30
Deficit carried forward	5,082.54

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1915, \$3,688.23; Local, \$2,900.00; County, \$2,900.00; State, \$1,649.62; Total ..	\$3,761.39
Steel I-beam bridges: No. built, 2; Total length, 46 ft.; containing 143.1 cu. yds. concrete; 20,120 lbs. steel; cost per ft., \$43.60	2,006.00
Steel truss bridges: No. built, 1; Total length, 85 ft. containing 239.2 cu. yds. concrete; 67,260 lbs. steel; cost per ft., \$70.40	5,980.00
Steel plate girder bridges: No. built, 1; Total length, 45 ft., containing 108.3 cu. yds. concrete; 23,690 lbs. steel; cost per ft., \$40.70	1,830.00
Total No. bridges built, 4; Total length, 176 ft.; Total expenditures	9,816.00
Deficit carried forward	6,054.61

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$5,082.54; Local, \$500.00; County, \$20,500.00; State, \$5,369.61; Other, \$1,000.00; Total	\$22,287.07
Mileage: Graded and surfaced, 0.39 miles; Graded not surfaced, 1.49 miles; Total, 1.88 miles; Approximate number roads built, 2	
Grading: 1.88 miles at \$1,786 per mile; 9,000 cu. yds. earth moved at 43 cts. per cu. yd.; average excavation per mile, 4,780 cu. yds.	3,895.23
Culverts: 6 conc. culverts; 101.2 cu. yds. conc. at \$12.42 per cu. yd.	1,255.58
1 metal culvert	117.61
Total cost per mile of all culverts, \$730	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Shale: 0.39 miles at \$1,390; 2,079 sq. yds at 26 cts ...	542.57
Miscellaneous Items:	
Right of way purchased	1,022.50
Guard rail: 763 lin. ft. at 25 cts. per lin. ft.	189.43
Miscellaneous	494.41
Total cost per mile of all miscellaneous items, \$907	
Total expenditures for 1917 road construction	7,517.88
Balance carried forward	14,769.69

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$6,054.61; Local, 6,550.00; County, \$6,550.00; State, \$3,349.40; Total...	\$10,394.79
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 50 ft.; containing, 233.3 cu. yds. concrete, 13,620 lbs. steel; cost per ft., \$71.50; per cu. yd., \$15.30	
Total No. bridges built, 3; Total length, 50 ft.; Total expenditures	3,573.00
Balance carried forward	6,821.79

RICHLAND COUNTY

STATEMENT JANUARY 1, 1918.

Funds available for road and bridge construction, 1917..	\$32,681.86
Expenditures for state aid road construction	7,517.38
Expenditures for state aid bridge construction	3,573.00
Total state aid expenditures	11,090.38
Balance available for 1918	21,591.48
Total appropriation for 1918 road and bridge construction	21,134.38
Amount available 1918	42,725.86

ROCK COUNTY

This is one of the oldest good roads counties in the state and consequently has a very large mileage of surfaced roads, and just as naturally its maintenance problem is now very acute.

The county organization is coping with this problem quite adequately, but if the county road system is to be preserved and improved it will require very heavy appropriations and a more adequate maintenance organization than has so far been provided.

Generally the county board has given good support to the road movement, and it may be expected that the board will do all that it can to meet the present situation, which is one of the most acute in the state.

ROCK COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$1,189.73; Local, \$35,034.69; County, \$35,034.69; State, \$22,334.38; Advanced, \$5,502.97; Other, \$11,742.37; Total	\$108,459.37
Net amount transferred to bridge fund	4,868.80
Net total available for road construction	103,590.57
Mileage: Graded and surfaced, 22.23 miles; Surfaced not graded, 0.09 miles; Total, 22.32 miles; Approximate number roads built, 21	
Grading: 22.23 miles at \$825 per mile; 50,900 cu. yds. earth moved (estimated)	18,361.70
Culverts: 16 conc. culverts; 207.1 cu. yds. conc. at \$8.46 per cu. yd.	1,761.56
7 culverts repaired	706.10
Total cost per mile of all culverts, \$110	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 3.10 miles at \$2,800; 16,380 sq. yds. at 53 cts.	8,660.76
Crushed gravel: 7.32 miles at \$2,100; 38,656 sq. yds. at 40 cts.	15,368.32
Pit run gravel: 11.28 miles at \$1,356; 59,541 sq. yds. at 26 cts.	15,299.27
Concrete: 0.62 miles; 5,369 sq. yds.	5,734.22

ROCK COUNTY**RECONSTRUCTION**

Mileage: Graded and surfaced, 5.36 miles; Surfaced not graded, 1.38 miles; Graded not surfaced, 0.20 miles; Total, 6.94 miles; Approximate number roads built, 8	
Grading: 5.56 miles at \$173 per mile	\$960.37
Culverts: 7 conc. culverts; 81.5 cu. yds. conc. at \$8.50 per cu. yd.	693.36
4 culverts repaired	462.61
Total cost per mile of all culverts, \$208	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed gravel: 3.19 miles at \$814; 27,900 sq. yds at 15 cts.	4,308.52
Pit run gravel: 3.55 miles at \$740; 21,600 sq. yds. at 14 cts.	3,038.01
Miscellaneous Items:	
Tile underdrain	82.87
Guard rail	1,165.59
Miscellaneous	3,326.46
Total cost per mile of all miscellaneous items, \$205	
Total expenditures for 1916 road construction	79,929.72
Balance (after deducting advances)	18,157.88
Paid on 1915 contracts previously reported	11,526.96
Balance carried forward	6,631.82

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$3,883.70; Local, \$4,350.00; County, \$4,350.00; State, \$2,773.07; Total		\$15,356.77
Net amount transferred from road fund		4,868.80
Net total available for bridge construction		29,225.57
Reinforced concrete slab and girder bridges: No. built, 9; Total length, 122 ft.; containing, 552.9 cu. yds. concrete; 27,760 lbs. steel; cost per ft., \$46.90; per cu. yd., \$10.35		5,724.01
Steel I-beam bridges: No. built, 5; Total length, 134 ft.; containing 409.6 cu. yds. concrete; 59,380 lbs. steel; cost per ft., \$42.70		5,715.26
Steel truss bridges: No. built, 1; Total length, 50 ft.; containing 145.9 cu. yds. concrete; 25,890 lbs. steel; cost per ft., \$61.90		3,094.24
Steel plate girder bridges: No. built, 1; Total length, 40 ft.; containing 255.0 cu. yds. concrete; 19,100 lbs. steel; cost per ft., \$77.20		3,988.06
Total No. bridges built, 16; Total length, 346 ft.; total expenditures		17,621.57
Balance carried forward		2,604.00

ROCK COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$6,631.82; Local, \$33,163.00; County, \$33,163.00; State, \$22,736.14; Advanced, \$2,100.00; Other, \$0.44; Total	\$97,794.40
Mileage: Graded and surfaced, 29.29 miles; Surfaced not graded, 0.46 miles; Graded not surfaced, 0.42 miles; Total, 30.17 miles; Approximate number roads built, 42	
Grading: 29.71 miles at \$1,000 per mile; 68,500 cu. yds. earth moved at 43 cts. per cu. yd.; average excavation per mile, 2,300 cu. yds.	29,781.57
Culverts: 25 conc. culverts; 283.5 cu. yds. conc. at \$10.40 per cu. yd.	2,971.68
Total cost per mile of all culverts, \$100	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone. 0.74 miles at \$2,735; 3,900 sq. yds. at 52 cts.	2,024.15
Crushed gravel: 14.34 miles at \$2,365; 77,482 sq. yds. at 45 cts.	34,582.33
Pit run gravel: 14.46 miles at \$1,508; 76,381 sq. yds. at 29 cts.	21,829.51
Concrete: 0.21 miles at \$9,810; 2,400 sq. yds. at \$1.85	4,459.30
Miscellaneous Items:	
Right of way purchased	65.00
Guard rail	245.60
Riprap	236.69
Miscellaneous	3,446.03
Total cost per mile of all miscellaneous items, \$134	
Total expenditures for 1917 road construction	99,641.86
Deficit (after deducting advances)	3,947.46
Returned to local units	1,000.00
Deficit carried forward	4,947.46

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$2,604.00; Local, \$4,250.00; County, \$4,250.00; State, \$2,913.78; Total	\$14,017.78
Reinforced concrete slab and girder bridges: No. built, 14; Total length, 170 ft.; containing, 751.5 cu. yds. concrete; 40,140 lbs. steel; cost per ft., \$56.70; per cu. yd., \$12.80	
Total No. bridges built, 14; Total length, 170 ft.; total expenditures	9,634.10
Balance carried forward	4,383.68

STATEMENT JANUARY 1, 1918.

Funds available for road and bridge construction, 1918..	\$110,812.18
Expenditures for state aid road construction	99,641.86
Expenditures for state aid bridge construction	9,634.10
Total state aid expenditures	109,275.96
Deficit for 1918 (after deducting advances of \$2,100.00)	563.78
Total appropriation for 1918 road and bridge construction	110,854.05
Amount available 1918	109,790.27

RUSK COUNTY

This county has continued to give some difficulties due to the divided local sentiment as to what should be done. This sentiment, however, was pretty well crystalized toward first building up the main roads of the county, and in recent years the work in this county has more nearly met state standards.

The construction and maintenance are fairly well done and, all in all, conditions in this county are gradually and slowly improving.

RUSK COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$19,025.64; County, \$6,256.45; State, \$3,743.55; Total	\$29, 025.64
Mileage: Graded and surfaced, 1.42 miles; Surfaced not graded, 0.40 miles; Graded not surfaced, 2.34 miles; Total, 4.16 miles; Approximate number roads built, 6	
Grading: 3.76 miles at \$2,175 per mile; 17,760 cu. yds. earth moved at 46 cts. per cu. yd.; average excavation per mile, 4,730 cu. yds.	8, 179.12
Culverts: 3 conc. culverts; 38.8 cu. yds. conc. at \$876 per cu. yd.	340.00
3 metal culverts; 2 culverts repaired	73.00
Total cost per mile of all culverts, \$110	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed gravel: 1.42 miles at \$1,567; 14,616 sq. yds. at 29 cts.	4, 342.44
Pit run gravel: 0.40 miles at \$1,440; 2,800 sq. yds. at 27 cts.	763.05
Miscellaneous Items:	
Guard rail: 1,360 lin. ft. at 14 cts per lin. ft.	191.27
Ditching and draining	258.75
Miscellaneous	496.03
Total cost per mile of all miscellaneous items, \$25	
Total expenditures for 1916 road construction	14, 643.66
Balance	14, 381.98

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$14,938.51; Total	\$14, 938.51
Steel plate girder bridges: No. built, 1; Total length, 421 ft.; containing 1,268.2 cu. yds. concrete; 253,600 lbs. steel; cost per ft., \$53.60	
Total No. bridges built, 1; Total length, 421 ft.; Total expenditures	22, 562.50
Deficit carried forward	7, 623.99

RUSK COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$14,381.98; County, \$9,000.00; State, \$4,066.08; Total,	\$27,448.06
Mileage: Graded not surfaced, 6.00 miles; Total 6.00 miles; Approximate number roads built, 3	
Grading: 6.00 miles	
Culverts: 3 metal culverts; 2 culverts repaired	124.55
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: (Work Incomplete)	2,235.14
Miscellaneous Items:	
Clearing and grubbing	269.84
Ditching and draining	206.65
Total cost per mile of all miscellaneous items, \$79	
Total expenditures for 1917 road construction	5,327.73
Balance carried forward	22,120.83
Net balance of local units (non state aid)	10,511.49
Net balance in state aid fund carried forward	11,608.84

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$7,623.99; Total deficit..	\$7,623.99
Reinforced concrete slab and girder bridges: No. built, 2; Total length, 20 ft.; containing 98.4 cu. yds. concrete; 2,530 lbs. steel; cost per ft., \$57.50; per cu. yd., \$11.70	
Total No. bridges built, 2; Total length, 20 ft.; Total expenditures	1,150.00
Deficit carried forward	8,773.99

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917 ..	\$9,312.58
Expenditures for state aid road construction	5,327.73
Expenditures for state aid bridge construction	1,150.00
Total state aid expenditures	6,477.73
Balance available for 1918	2,834.85
Total appropriation for 1918 road and bridge construction	9,582.44
Amount available 1918	12,417.29

ST. CROIX COUNTY

After a very slow start this county is now progressing rapidly and has more than caught up with its neighbors in road construction, maintenance and sentiment. Construction is good, maintenance excellent. It may be expected that the county will keep pace with the other northwestern counties.

ST. CROIX COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$499.88; Local, \$11,-746.00; County, \$11,746.00; State, \$7,305.39; Advanced, \$4,548.78; Other, \$3,568.72; Total	\$39,414.77
Mileage: Graded and surfaced, 8.59 miles; Surfaced not graded, 4.92 miles; Graded not surfaced, 7.66 miles; Total, 21.17 miles; Approximate number roads built 28	
Grading: 16.25 miles at \$1,008 per mile; 58,085 cu. yds. earth moved at 28 cts. per cu. yd.; average excavation per mile, 3,575 cu. yds.	16,378.89
Culverts: 29 conc. culverts; 452.3 cu. yds. conc. at \$7.53 per cu. yd.	3,406.29
3 metal culverts	64.50
Total cost per mile of all culverts, \$214	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.25 miles at \$2,820; 5,866 sq. yds. at 53 cts.	3,129.43
Pit run gravel: 13.23 miles at \$818; 79,498 sq. yds. at 15 cts.	12,317.22
Concrete: 0.03 miles at \$7,305; 1,829 sq. yds at \$1.38..	2,524.93
Miscellaneous Items:	
Clearing and grubbing	55.00
Guard rail: 2,184 lin. ft. at 17 cts. per lin. ft.	397.68
Miscellaneous	92.36
Total cost per mile of all miscellaneous items, \$33	
Total expenditures for 1916 road construction	38,366.30
Deficit carried forward (after deducting advances) ..	3,500.31

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance, 1915, \$646.37; Local, \$2,-825.00; County, \$2,825.00; State, \$1,757.01; Total..	\$8,053.38
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 42 ft.; containing 187.4 cu. yds. concrete, 5,940 lbs. steel; cost per ft., \$46.95; per cu. yd., \$10.50	1,971.80
Steel I-beam bridges: No. built, 6; Total length, 124 ft.; containing 342.3 cu. yds. concrete; 44,000 lbs. steel; cost per ft., \$32.20	3,994.00



FIG. 1. A view on Trunk Highway No. 12, St. Croix County, before improvement.



FIG. 2. The same road as shown in Figure 1 after improvement.



FIG. 3. A view on State Trunk Highway No. 46 between New Richmond and Deer Park, St. Croix County. Note the fill well protected by guard fence.

ST. CROIX COUNTY

Steel plate girder bridges: No. built, 1; Total length, 35 ft., containing 59.5 cu. yds. concrete; 16,450 lbs. steel; cost per ft., \$23.15	\$811.00
Total No. bridges built, 11; Total length, 201 ft.; Total expenditures	6,776.80
Balance carried forward	1,276.58

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$3,500.31; Local, \$14,-891.00; County, \$14,891.00; State, \$8,618.46; Other, \$199.98; Total	\$35,100.13
Mileage: Graded and surfaced, 5.54 miles; Graded not surfaced, 5.60 miles; Total, 11.14 miles; Approximate number roads built, 18	
Grading: 11.14 miles at \$1,060 per mile; 39,015 cu. yds. earth moved at 30 cts. per cu. yd.; average excavation per mile, 3,500 cu. yds.	11,804.92
Culverts: 21 conc. culverts; 272.9 cu. yds. conc. at \$10.73 per cu. yd.	2,930.97
1 metal culvert; 1 culvert repaired	55.75
Total cost per mile of all culverts, \$268	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 0.62 miles at \$500 per mile	315.00
Pit run gravel: 4.92 miles at \$1,110; 33,894 sq. yds. at 21 cts.	7,106.94
Miscellaneous Items:	
Guard rail: 7,755 lin. ft. at 22 cts. per lin. ft.	1,683.78
Miscellaneous	218.40
Total cost per mile of all miscellaneous items, \$170	
Total expenditures for 1917 road construction	24,115.76
Balance carried forward	10,984.37

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$1,276.58; Local, \$1,-750.00; County, \$1,750.00; State, \$1,012.94; Total..	\$5,789.52
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 50 ft.; containing 250.6 cu. yds. concrete; 10,960 lbs. steel; cost per ft., \$61.30; per cu. yd., \$12.25	
Total No. bridges built, 4; Total length, 50 ft.; Total expenditures	3,063.94
Balance carried forward	2,725.58

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$40,889.65
Expenditures for state aid road construction	24,115.76
Expenditures for state aid bridge construction	3,063.94
Total state aid expenditures	27,179.70
Balance available for 1918	13,709.95
Total appropriation for 1918 road and bridge construction	42,721.23
Amount available 1918	56,431.18

SAUK COUNTY

Sauk County was for several years the leading county in road construction relative to its valuation. Unfortunately this very extensive construction was not accompanied by maintenance, and in the fall of 1915 it seemed that much of the county's investment in surfaced roads would be lost.

With the creation of the County State Road & Bridge Committee and the election of a new county highway commissioner in the spring of 1916, conditions took a change much for the better. Construction in recent years has not been heavy but the attention of the county department has been devoted largely to maintenance, with very satisfactory results.

At the present time due to the extensive use of bituminous materials and extensive resurfacing, the county highway system is in better shape than it has ever been, which is a wonderful accomplishment considering the travel on the roads in this county.

The county organization is doing all it can to meet the present situation and is to be congratulated on its success. The county board, from a lukewarm policy toward maintenance, has changed to one of enthusiastic support, and conditions in this county were never better for further progress.

SAUK COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$25,414.20; Local, \$39,-	
877.62; County, \$39,877.62; State, \$13,844.52; Ad-	
vanced, \$15,182.17; Other, \$5,216.74; Total	88,584.47
Net amount transferred to bridge fund	464.28
Net total available for road construction	\$88,120.19
Mileage: Graded and surfaced, 11.73 miles; Surfaced not	
graded; 4.12 miles; Graded not surfaced, 2.88	
miles; Total, 18.73 miles; Approximate number roads	
built, 29	
Grading: 14.61 miles at \$628 per m'le, 36,665 cu. yds.	
earth moved at 25 cts. per cu. yd.; average excava-	
tion per mile, 2,510 cu. yds.	9,144.58
Culverts: 37 conc. culverts; 320 cu. yds. conc. at \$12.00	
per cu. yd.	3,755.91
Other culvert expenditures	1,072.40
Total cost per mile of all culverts, \$330	
Surfacing: (Cost per mile given is based on 9 ft. width	
of surfacing)	
Crushed stone: 8.76 miles at \$3,130; 46,230 sq. yds. at	
59 cts.	27,449.95
Crushed gravel: 5.20 miles at \$2,634; 32,214 sq. yds. at	
50 cts.	18,737.18
Pit run gravel: 0.52 miles at \$510; 2,800 sq. yds. at	
9 cts.	265.81

SAUK COUNTY

Concrete: 0.49 miles at \$6,240; 4,281 sq. yds. at \$1.18	\$5,053.86
Slate: 0.59 miles at \$1,870; 3,120 sq. yds. at \$32.....	1,103.67
Brick: 0.29 miles at \$8,210; 3,356 sq. yds. at \$1.56 ..	5,212.58
Miscellaneous Items:	
Right of way purchased	2,045.00
Clearing and grubbing	690.35
Tile underdrain	33.75
Curb and gutter	70.23
Guard rail 3,200 lin. ft. at 22 cts per lin ft.	696.99
Sewer	68.70
Riprap	73.99
Miscellaneous	912.95
Total cost per mile of all miscellaneous items, \$315	
Total expenditures for 1916 road construction	76,387.90
Payments on road construction of preceding years	157.90
Total road disbursements 1916	76,545.80
Deficit carried forward (after deducting advances)...	3,607.78

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$6,639.67; Local, \$415.50; County, \$415.50; State, \$138.48; Total	\$7,609.15
Net amount transferred from road fund	464.28
Net total available for bridge construction	8,073.43
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 10 ft.; containing 75.6 cu. yds. concrete; 1,440 lbs. steel; cost per ft., \$51.00; per cu. yd. \$6.75	
Total No. bridges built, 1; Total length, 10 ft.; Total expenditures	510.00
Balance carried forward	7,563.43

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$3,607.78; Local, \$38,295.44; County, \$38,295.44; State, \$14,680.39; Advanced, \$23,305.64; Other, \$6,323.86; Total	\$117,292.99
Net amount transferred to bridge fund	553.46
Net total available for road construction	116,739.53
Mileage: Graded and surfaced, 9.17 miles; Surfaced not Graded, 2.71 miles; Graded not surfaced, 9.15 miles; Total, 21.03 miles; Approximate number roads built, 22	
Grading: 18.32 miles at \$611 per mile; 42,360 cu. yds. earth moved at 26 cts. per cu. yd.; average excavation per mile, 2,310 cu. yds.	12,021.49
Culverts: 42 conc. culverts; 496.6 cu. yds. conc. at \$8.93 per cu. yd.	4,438.98
Total cost per mile of all culverts, \$242	



FIG. 1. A well designed and properly equipped portable gravel crushing and screening plant in Sauk County. The material is delivered to the elevator shown in right of picture by wheelers. A one inch revolving screen removes the finer material which passes over into the crusher elevator. The coarse material only, passes through the crusher jaws thereby increasing the daily output.



FIG. 2. A view on State Trunk Highway No. 11, Sauk County, showing the manner in which the unused top soil on sandy sections may be moved to cover up the old worn out sand. This makes a reasonably good wearing surface, when persistently maintained by the use of the road grader or planer.



FIG. 3. A tractor hauling six $2\frac{1}{2}$ yard wagons loaded with crushed stone on a three mile haul in Sauk County. This method of hauling, in some instances, has proven very satisfactory, but the haul must be over one mile in length to make it profitable.

SAUK COUNTY**Surfacing:** (Cost per mile given is based on 9 ft. width of surfacing)

Crushed stone: 6.83 miles at \$3,680; 37,345 sq. yds. at 70 cts.	\$30,612.05
Crushed gravel: 4.08 miles at \$4,050; 21,533 sq. yds. at 77 cts.	17,539.31
Concrete: 0.97 miles at \$7,100; 8,596 sq. yds. at \$1.34	11,543.80
Oil	961.15

Miscellaneous Items:

Right of way purchased	675.00
Clearing and grubbing	469.06
Guard rail: 89 lin. ft. at 81 cts. per lin. ft.	65.00
Miscellaneous	1,897.50
Total cost per mile of all miscellaneous items, \$170	
Total expenditures for 1917 road construction	80,223.34
Balance (after deducting advances)	13,210.55
Returned to contingent fund	522.52
Balance carried forward	12,688.03

1917 STATE AID BRIDGE CONSTRUCTION**Funds Available:** Balance 1916, \$7,563.43; Local, \$900.00;

County, \$900.00; State, \$331.17; Total	\$9,694.60
Net amount transferred from road fund	553.46
Net total available for bridge construction	10,248.06
Balance carried forward	10,248.06

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$126,465.07
Expenditures for state aid road construction	80,223.34
Total state aid expenditures	80,223.34
Balance available for 1918 (after deducting advances of \$23,305.64)	22,936.09
Total appropriation for 1918 road and bridge construction	90,385.11
Amount available 1918	113,321.20



FIG. 1. A portion of the Beaver Hill relocation between Spring Green and Plain, Sauk County. The old road had grades as steep as 22%. The maximum grade on the relocation is $7\frac{1}{2}\%$.



FIG. 2. A well maintained surfaced treated macadam road near Reedsburg, Sauk County. Note the manner in which the trees are trimmed up at the turn.



FIG. 3. A specially designed culvert for use at a road intersection.

SAWYER COUNTY

This county started very slowly under the State Aid law and development has not been rapid. Neither has the road sentiment in this county been as strong as in most of the adjoining counties.

Construction is improving and maintenance this year is excellent. There is every reason to believe that from now on Sawyer County will proceed at a normal rate.

SAWYER COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$357.12; County, \$4,500.00; State, \$2,876.25; Other, \$10,531.47; Total,	\$18,264.84
Mileage: Graded not surfaced, 6.76 miles; Total, 6.76 miles; Approximate number roads built, 9	
Grading: 6.76 miles at \$984 per mile; 25,991 cu. yds. earth moved at 27 cts. per cu. yd.; average excavation per mile, 3,850 cu. yds.	6,909.89
Culverts: 2 conc. culverts; 50.0 cu. yds. conc. at \$8.25 per cu. yd.	457.39
7 metal culverts	176.53
Total cost per mile of all culverts, \$90	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Miscellaneous Items:	
Clearing and grubbing	1,785.03
Guard rail: 135 lin. ft at 21 cts. per lin. ft.	27.90
Ditching and draining	272.57
Miscellaneous	4,028.52
Total cost per mile of all miscellaneous items, \$900	
Total expenditures for 1916 road construction	13,657.83
Balance carried forward	4,607.01

NO. 1916 STATE AID BRIDGE CONSTRUCTION**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$4,607.01; County, \$5,000.00; State \$2,892.2 ; Other \$1,834.26; Total..	\$14,333.56
Mileage: Graded not surfaced, 18.22 miles; Total, 18.22 miles; Approximate number roads built, 11	
Grading: 18.22 miles at \$796 per mile; 56,106 cu. yds. earth moved at 25 cts. per cu. yd.; average excavation per mile, 3,075 cu. yds.	12,793.53

SAWYER COUNTY

Culverts: 3 conc. culverts; 30.1 cu. yds. conc. at \$12.28	
per cu. yd.	\$370.00
Total cost per mile of all culverts, \$20	
Miscellaneous Items:	
Clearing and grubbing	485.72
Ditching and draining	51.05
Miscellaneous	6.96
Total cost per mile of all miscellaneous items, \$29	
Total expenditures for 1917 road construction	13,707.26
Balance carried forward	626.30

1917 STATE AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 32 ft.; containing 135.2 cu. yds. concrete; 8,130 lbs. steel; cost per ft. \$78.70; per cu. yd. \$18.60	
Total No. bridges built, 2; Total length, 32 ft.; Total expenditures	\$2,519.00
Deficit carried forward	2,519.00

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction 1917	\$14,333.56
Expenditures for state aid road construction	13,707.26
Expenditures for state aid bridge construction	2,519.00
Total state aid expenditures	16,226.26
Deficit for 1918	1,892.70
Total appropriation for 1918 road and bridge construction	7,894.13
Amount available 1918	6,001.43

SHAWANO COUNTY

Starting slowly in 1912, this county has made consistent progress. The construction has been good and the maintenance good. The county highway commissioner, Mr. O. C. Rollman went over to the State organization in 1918, but an honest effort has been made to keep the county work up to the high standard set by him.

This county is in good shape and should make considerable further progress.

SHAWANO COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$3,033.55; Local, \$12,304.00; County, \$12,304.00; State, \$7,972.71; Advanced, \$600.00; Other, \$1,320.74; Total	\$37,535.00
Mileage: Graded and surfaced, 4.77 miles; Surfaced not graded, 1.84 miles; Graded not surfaced, 6.17 miles; Total, 12.78 miles; Approximate number roads built, 17	
Grading: 10.94 miles at \$1.193 per mile; 32,900 cu. yds. earth moved at 40 cts. per cu. yd.; average excavation per mile, 3,000 cu. yds.	13,273.58
Culverts: 20 conc. culverts; 295.5 cu. yds. conc. at \$9.80 per cu. yd.	2,897.68
4 metal culverts	127.68
Total cost per mile of all culverts, \$277	
Surfacing. (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.21 miles at \$2,590; 2,170 sq. yds. at 49 cts.	1,059.72
Crushed gravel: 3.79 miles at \$2,100; 20,000 sq. yds. at 40 cts.	7,123.76
Pit run gravel: 1.89 miles at \$1,288; 10,954 sq. yds. at 24 cts.	2,767.26
Road oil: 26,736 sq. yds. at 3.5 cts.	936.93
Disintegrated granite: 0.72 miles at \$1,204; 8,322 sq. yds. at 23 cts.	1,891.78
Miscellaneous Items:	
Right of way purchased	15.00
Clearing and grubbing	642.48
Tile underdrain	245.66
Curb and gutter	182.15
Guard rail: 64 lin. ft. at 18 cts. per lin. ft.	33.64
Ditching and draining	147.62
Riprap	59.32
Miscellaneous	450.03
Total cost per mile of all miscellaneous items, \$162	
Total expenditures for 1916 road construction	31,854.27
Balance carried forward (after deducting advances) ..	5,080.73



FIG. 1. An interesting view on State Trunk Highway No. 16, Shawano County. Note the smooth gravel surface and the pine stump fences. Many such fences are seen throughout northern Wisconsin.



FIG. 2. A State Trunk Highway mile post on Trunk Highway No. 22, Shawano County.



FIG. 3. A modern gravel crushing plant. The material is delivered by wheelers or slushers, and elevated into the crusher. Note the elevator and screens.

SHAWANO COUNTY**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Deficit 1915, \$987.43; Local, \$1,190.00; County, \$1,190.00; State, \$771.09; Total	\$2, 163.66
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 54 ft.; containing, 200.4 cu. yds. concrete; 11,600 lbs. steel; cost per ft., \$39.75; per cu. yd., \$19.70	2, 147.39
Steel I-beam bridges: No. built, 3; Total length, 62 ft.; containing 125.8 cu. yds. concrete; 22,730 lbs. steel; cost per ft., \$23.15	1, 432.48
Total No. bridges built, 6; Total length, 116 ft.; total expenditures	3, 579.87
Deficit carried forward	1, 416.21

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$5,080.73; Local, \$17,150.00; County, \$17,150.00; State, \$8,195.20; Advanced, \$600.00; Other, \$209.68; Total	\$48, 376.61
Net amount transferred from bridge fund	705.18
Net total available for road construction	49, 081.79
Mileage. Graded and surfaced, 5.69 miles; Surfaced not graded, 2.12 miles; Graded not surfaced, 6.49 miles; Total 14.30 miles; Approximate number roads built, 26	
Grading: 12.18 miles at \$1,110 per mile; 29,800 cu. yds. earth moved at 46 cts. per cu. yd.; average excavation per mile, 2,450 cu. yds.	13, 675.27
Culverts: 23 conc. culverts; 288.7 cu. yds. conc. at \$11.60 per cu. yd.	3, 357.64
7 metal culverts; 3 culverts repaired	326.07
Total cost per mile of all culverts, \$302	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.74 miles at \$3,390; 5,300 sq. yds. at 65 cts.	3, 419.64
Crushed gravel: 0.60 miles at \$3,330; 3,150 sq. yds. at 63 cts.	1, 995.18
Pit run gravel: 6.34 miles at \$1,190; 34,180 sq. yds. at 22 cts.	7, 714.12
Concrete: 0.13 miles at \$9,820; 1,400 sq. yds. at \$1.82	2, 557.75
Oil	17.52
Disintegrated granite	1, 019.16
Miscellaneous Items:	
Right of way purchased	80.00
Clearing and grubbing	1, 202.52
Tile underdrain	84.55
Guard rail: 5.36 lin. ft. at 20 cts. per lin. ft.	108.38
Miscellaneous	673.60
Total cost per mile of all miscellaneous items, \$176	
Total expenditures for 1917 road construction	36, 231.40
Balance carried forward (after deducting advances) ..	12, 250.39

SHAWANO COUNTY

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$1,416.21; Local, \$2,050.00; County, \$2,050.00; State, \$979.64; Total ..	\$3, 663.43
Net amount transferred to road fund	705.18
Net total available for bridge construction	2, 958.25
Reinforced concrete slab and girder bridges: No. built, 6; Total length, 58 ft.; containing 268.2 cu. yds. concrete; 12,160 lbs. steel; cost per ft., \$45.60; per cu. yd., \$9.90	2, 645.93
Steel truss bridges: No. built, 1; Total length, 65 ft.; containing 138.6 cu. yds. concrete; 39,400 lbs. steel; cost per ft., \$26.05	1, 693.00
Total No. bridges built, 7; Total length, 123 ft.; Total expenditures	4, 338.93
Deficit carried forward	1, 380.68

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$52, 040.04
Expenditures for state aid road construction	36, 231.40
Expenditures for state aid bridge construction	4, 338.93
Total state aid expenditures	40, 570.33
Balance available for 1918 (after deducting advances of \$600.00)	10, 869.71
Total appropriation for 1918 road and bridge construction	35, 218.25
Amount available 1918	46, 087.96

SHEBOYGAN COUNTY

Sheboygan County started construction under the State Aid law very slowly and suspiciously. In recent years progress has been very rapid and the development of road sentiment very marked.

Construction has been consistently good and the maintenance is also good. Several changes in the county highway commissioner-ship have not made for the best results, but nevertheless the work has been kept to a good general standard and is generally satisfactory.

This county will soon be ripe for much further development, and is without a doubt further advanced in road sentiment than any of the other counties in eastern Wisconsin north of Milwaukee.

SHEBOYGAN COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$2,557.64; Local, 26,-265.66; County, \$26,265.66; State, \$18,028.20; Advanced, \$24,750.00; Other, \$186.08; Total	\$92, 937.96
Net amount transferred from bridge fund	200.05
Net total available for road construction	93, 138.01
Mileage: Graded and surfaced, 8.57 miles; Surfaced not graded, 1.46 miles; Graded not surfaced, 3.56 miles; Total, 13.59 miles; Approximate number roads built, 19	

SHEBOYGAN COUNTY

Grading: 12.13 miles at \$1,323 per mile; 38,086 cu. yds. earth moved at 42 cts. per cu. yd.; average excavation per mile, 3,140 cu. yds.	\$16, 047.83
Culverts: 37 conc. culverts; 481.3 cu. yds. conc. at \$10.64 per cu. yd.	5, 117.34
4 culverts repaired	236.80
Total cost per mile of all culverts, \$441	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 2.90 miles at \$2,780; 15,310 sq. yds. at 53 cts.	8, 058.92
Crushed gravel: 4.47 miles at \$2,455; 24,211 sq. yds. at 46 cts.	11, 745.38
Pit run gravel: 0.79 miles at \$639; 4,430 sq. yds. at 12 cts.	587.29
Concrete: 1.87 miles at \$7,210; 13,761 sq. yds. at \$1.36	26, 949.48
Miscellaneous Items:	
Clearing and grubbing	634.65
Tile underdrain	194.40
Guard rail: 1,917 lin. ft. at 12 cts per lin. ft.	464.67
Ditching and draining	632.22
Miscellaneous	2, 382.73
Total cost per mile of all miscellaneous items, \$355	
Total expenditures for 1916 road construction	73, 001.71
Deficit carried forward (after deducting advances) ...	4, 613.70

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Local, \$2,900.00; County, \$2,900.00; State, \$1,990.50; Total	\$7, 790.50
Net amount transferred to road fund	200.05
Net total available for bridge construction	7, 590.45
Reinforced concrete slab and girder bridges: No. built, 6; Total length, 153 ft.; containing 838.9 cu. yds. concrete; 37,050 lbs. steel; cost per ft., \$45.55; per cu. yd., \$8.30	6, 974.15
Total No. bridges built, 6; Total length, 153 ft.; Total expenditures	6, 974.15
Balance carried forward	616.30

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$4,613.70; Local, \$29,400.00; County, \$29,400.00; State, \$20,707.97; Advanced, \$17,900.00; Other, \$571.47; Total	\$93, 365.74
Mileage: Graded and surfaced, 6.56 miles; Surfaced not graded, 0.08 miles; Graded not surfaced, 1.98 miles; Total, 8.62 miles; Approximate number roads built, 13	
Grading: 8.54 miles at \$1,970 per mile; 40,306 cu. yds. earth moved at 42 cts. per cu. yd.; average excavation per mile, 4,720 cu. yds.	16, 825.75

SHEBOYGAN COUNTY

Culverts: 18 conc. culverts; 186.0 cu. yds. conc. at \$12.40 per cu. yd.	\$2,310.62
1 culvert repaired	44.76
Total cost per mile of all culverts, \$276	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 1.33 miles at \$4,515; 7,000 sq. yds. at 86 cts.	6,008.96
Crushed gravel: 2.90 miles at 1,840; 15,428 sq. yds. at 35 cts.	5,780.69
Pit run gravel: 1.42 miles at 1,510; 9,333 sq. yds. at 29 cts.	2,673.66
Concrete: 0.99 miles at \$8,220; 9,803 sq. yds. at \$1.56	15,295.26
Oil	48.32
Miscellaneous Items:	
Clearing and grubbing	868.46
Guard rail: 2,850 lin. ft. at 19 cts. per lin. ft.	454.23
Miscellaneous	563.73
Total cost per mile of all miscellaneous items, \$221	
Total expenditures for 1917 road construction	50,874.44
Balance carried forward (after deducting advances) ..	24,591.30

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$616.30; Local, \$600.00; County, \$600.00; State, \$422.61; Total	\$2,238.91
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 10 ft.; containing 65.8 cu. yds. concrete; 2,550 lbs. steel; cost per ft., \$71.10 per cu. yd., \$10.80	
Total No. bridges built, 1; Total length, 10 ft.; Total expenditures	710.89
Balance carried forward	1,528.02

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917	\$95,604.65
Expenditures for state aid road construction	50,874.44
Expenditures for state aid bridge construction	710.89
Total state aid expenditures	51,585.33
Balance available for 1918 (after deducting advances of \$17,900.00)	26,119.32
Total appropriation for 1918 road and bridge construction	92,997.70
Amount available 1918	119,117.02

TAYLOR COUNTY

Results in this county have rapidly and very greatly improved under the present county highway commissioner. Construction is excellent and the maintenance is likewise excellent.

The County Board in 1917 adopted a County Trunk Line System for maintenance. These roads have been maintained by a tractor patrol and gang work with very good results.

This county may be expected to make consistent progress more rapidly than in the past.

TAYLOR COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$556.34; Local, \$6,200.00; County, \$6,200.00; State, \$4,083.35; Other, \$162.55; Total	\$17,202.24
Mileage: Graded and surfaced, 0.72 miles; Graded not surfaced, 8.10 miles; Total, 8.82 miles; Approximate number roads built, 16	
Grading: 8.82 miles at \$1,240 per mile; 35,530 cu. yds. earth moved at 31 cts. per cu. yd.; average excavation per mile, 4,030 cu. yds.	10,958.21
Culverts: 7 conc. culverts; 55.5 cu. yds. conc. at \$8.73 per cu. yd.	485.00
16 metal culverts; 1 culvert repaired	819.57
Total cost per mile of all culverts, \$148	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel: 0.72 miles at \$922; 3,800 sq. yds. at 17 cts.	664.05
Miscellaneous Items:	
Right of way purchased	10.00
Clearing and grubbing	85.00
Tile underdrain	200.21
Guard rail: 260 lin. ft. at 21 cts. per lin. ft.	54.00
Ditching and draining	496.57
Miscellaneous	667.81
Total cost per mile of all miscellaneous items, \$172	
Total expenditures for 1916 road construction	14,440.42
Balance	2,761.82
Paid on 1915 contracts previously reported	95.28
Balance carried forward	2,666.54

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1915, \$204.50; Local, \$250.00; County, \$250.00; State, \$164.65; Total	\$460.15
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 14 ft.; containing 65.1 cu. yds. concrete; 3,310 lbs. steel; cost per ft., \$49.20; per cu. yd., \$10.60	
Total No. bridges built, 1; Total length, 14 ft., Total expenditure	689.00
Deficit carried forward	228.85



FIG. 1. A sink hole on the Chelsea-Rib Lake Road, Taylor County. An apparently permanent road disappeared over night. Such sink holes are not uncommon in northern Wisconsin.



FIG. 2. A view of the sink hole shown in Fig. 1 as reconstructed after the collapse. This sink hole is 60 ft. across. In this case the road was improved with corduroy, which carries a very light gravel covering. Heavy filling must be avoided unless it is the intention to fill to the bottom.



FIG. 3. A well maintained gravel road in Taylor County.

TAYLOR COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$2,666.54; Local, \$9,- 500.00; County, \$9,500.00; State, \$4,412.19; Other, \$100.11; Total	\$26,178.84
Mileage: Graded and surfaced, 2.82 miles; Surfaced not graded, 6.18 miles; Graded not surfaced, 6.90 miles; Total, 15.90 miles; Approximate number roads built, 22	
Grading: 9.72 miles at \$1,090 per mile; 35,990 cu. yds. earth moved at 29 cts. per cu. yd.; average excava- tion per mile, 3,700 cu. yds.	10,617.94
Culverts: 16 conc. culverts; 162.4 cu. yds. conc. at \$10.60 per cu. yd.	1,721.41
13 metal culverts; 1 culvert repaired	713.08
Total cost per mile of all culverts, \$250	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Pit run gravel; 9.00 miles at \$1,048; 47,510 sq. yds. at 20 cts.	9,457.92
Miscellaneous Items:	
Right of way purchased	110.00
Clearing and grubbing	675.86
Guard rail: 550 lin. ft. at 22 cts. per lin. ft.	118.47
Riprap	779.56
Miscellaneous	844.24
Total cost per mile of all miscellaneous items, \$260	
Total expenditures for 1917 road construction	25,038.48
Balance carried forward	1,140.36
Paid on 1916 contracts (reported in 1916)	162.55
Balance carried forward	977.81

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$228.85; Local, \$250.00; County, \$250.00; State, \$116.10; Total	\$387.25
Balance carried forward	387.25

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$26,403.54
Expenditures for state aid road construction	25,038.48
Total state aid expenditures	25,038.48
Balance available for 1918	1,365.06
Total appropriation for 1918 road and bridge construc- tion	16,412.67
Amount available 1918	17,777.73



FIG. 1. Another sink hole in Taylor County before improvement.



FIG. 2. A view of the completed floating bridge spanning the sink hole shown in Figure 1. Corduroy was not sufficient here.



FIG. 3. A well maintained earth road in Taylor County.

TREMPEALEAU COUNTY

Trempealeau County has consistently kept up its progress in road construction, this being especially true in the neighborhood of Galesville, where very large construction projects have been carried out. As pointed out in a previous report, the construction in this county has not been on its main lines, and considering the amount expended the traveler gets very little impression as to the amount of good work done in this county. The county has determined to concentrate its work in the future and better results may be expected. The construction is good and the maintenance is fair.

There is no danger that this county will be left behind in building or maintaining its road system.

TREMPEALEAU COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$25,788.94; Local, \$26,- 576.17; County, \$26,576.17; State, \$6,787.66; Other, \$3,413.51; Total	\$89, 142.45
Mileage: Graded and surfaced, 8.53 miles; Surfaced not graded, 5.17 miles; Graded not surfaced, 4.70 miles; Total, 18.40 miles; Approximate number roads built, 27	
Grading: 13.23 miles; 64,600 cu. yds. earth moved at 23 cts. per cu. yd.; average excavation per mile, 4,880 cu. yds	14, 712.62
Culverts: 32 conc. culverts; 333.7 cu. yds. conc. at \$10.57 per cu. yd.	4, 741.42
2 metal culverts; 1 culvert repaired	191.24
Total cost per mile of all culverts, \$280	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 0.17 miles at \$588 per mile	99.60
Crushed stone: 7.67 miles at \$2,940; 46,211 sq. yds. at 56 cts.	27, 078.46
Brick: 0.18 miles at \$8,470; 1,911 sq. yds at \$1.59....	3, 049.97
Shale: 5.68 miles at \$765; 29,988 sq. yds. at 14 cts. ..	6, 193.19
Oil	1, 250.82
Miscellaneous Items:	
Right of way purchased	421.00
Clearing and grubbing	156.38
Curb and gutter	201.72
Guard rail: 2,864 lin. ft. at 28 cts. per lin. ft.	960.69
Ditching and draining	9.60
Miscellaneous	212.25
Total cost per mile of all miscellaneous items, \$148	
Total expenditures for 1916 road construction	59, 278.96
Balance carried forward	29, 863.49

TREMPEALEAU COUNTY

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$3,760.25; Local, \$3,-535.51; County, \$3,535.50; State, \$902.99; Total	\$11,734.25
Reinforced concrete slab and girder bridges: No. built, 2; Total length, 24 ft.; containing 133.8 cu. yds. concrete; 5,780 lbs. steel; cost per ft., \$56.70; per cu yd., \$10.15	
Total No. bridges built, 2; Total length, 24 ft.; Total expenditures	1,360.00
Balance carried forward	10,374.25

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$29,863.49; Local, \$27,-009.14; County, \$27,009.14; State, \$6,881.70; Advanced, \$8,339.99; Other, \$481.25; Total	\$99,584.71
Mileage: Graded and surfaced, 9.88 miles; Surfaced not graded, 1.80 miles; Graded not surfaced, 13.83 miles; Total, 25.51 miles; Approximate number roads built, 23	
Grading: 23.71 miles at \$861 per mile; 91,994 cu. yds. earth moved at 22 cts. per cu. yd.; average excavation per mile, 3,880 cu. yds.	20,412.46
Culverts: 67 conc. culverts; 811.9 cu. yds. conc. at \$39.42 per cu. yd.	7,643.64
Total cost per mile of all culverts, \$322	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 4.41 miles at \$2,950; 23,966 sq. yds. at 56 cts.	13,377.84
Shale: 7.27 miles at \$1,235; 41,420 sq. yds. at 23 cts. .	11,329.93
Miscellaneous Items:	
Right of way purchased	732.68
Clearing and grubbing	549.73
Guard rail: 6,814 lin. ft. at 29 cts. per lin. ft.	1,986.35
Ditching and draining	254.06
Miscellaneous	807.83
Total cost per mile of all miscellaneous items, \$183	
Total expenditures for 1917 road construction	57,094.52
Balance carried forward (after deducting advance)..	34,150.20

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$10,374.25; Local, \$4,-956.08; County, \$4,956.08; State, \$1,262.83; Total	\$21,549.24
Reinforced concrete slab and girder bridges: No. built, 5; Total length, 72 ft.; containing 316.9 cu. yds. concrete; 16,430 lbs. steel; cost per ft., \$75.20; per cu. yd. \$17.10	5,413.00
Steel I-beam bridges: No. built, 3; Total length, 80 ft.; containing 284.7 cu. yds. concrete; 37,830 lbs. steel; cost per ft., \$60.60	4,850.00
Steel plate girder bridges: No. built, 2; Total length, 90 ft.; containing 323.8 cu. yds. concrete; 51,420 lbs. steel; cost per ft., \$78.40	7,053.00

TREMPEALEAU COUNTY

Total No. bridges built, 10; Total length, 242 ft.; Total expenditures	\$17,316.00
Balance carried forward	4,233.24

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917	\$121,133.95
Expenditures for state aid road construction	57,094.52
Expenditures for state aid bridge construction	17,316.00
Total state aid expenditures	74,410.52
Balance available for 1918 (after deducting advances of \$8,339.99)	38,383.44
Total appropriation for 1918 road and bridge construction	63,807.59
Amount available 1918	102,191.03

VERNON COUNTY

Conditions in this county have improved. The construction work is good and the maintenance is also good.

It is felt that the present county committee is laboring to get the best results possible, and that the county highway commissioner has improved his methods and results very materially in the biennium.

All things considered, this county is making good progress

VERNON COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$10,250.65; Local, \$26,000.00; County, \$26,000.00; State, \$7,559.66; Advanced, \$5,702.06; Other \$91.68; Total	\$75,604.95
Mileage: Graded and surfaced, 2.22 miles; Surfaced not graded, 0.34 miles; Graded not surfaced, 12.36 miles; Total, 14.92 miles; Approximate number roads built, 20	
Grading: 14.58 miles at \$1,590 per mile; 71,600 cu. yds. earth moved at 38 cts. per cu. yd.; average excavation per mile, 4,910 cu. yds.	27,130.70
Culverts: 62 conc. culverts; 623.0 cu. yds. conc. at \$10.00 per cu. yd.	6,771.62
3 metal culverts	181.92
Total cost per mile of all culverts, \$477	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 2.12 miles at \$3,195; 19,455 sq. yds. at 60 cts.	13,193.66
Shale: 0.44 miles at \$1,200; 4,600 sq. yds. at 21 cts. ...	1,045.38

VERNON COUNTY

Miscellaneous Items:

Right of way purchased	\$3,936.00
Clearing and grubbing	329.74
Guard rail: 2,100 lin. ft. at 20 cts. per lin. ft.	430.61
Total cost per mile of all miscellaneous items, \$322	
Total expenditures for 1916 road construction	53,019.63
Balance (after deducting advances)	16,882.36
Returned to local units	4,831.30
Balance carried forward	12,051.06

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$10,468.92; Local, \$5,625.00; County, \$5,625.00; State, \$1,635.49; Total	\$23,354.41
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 34 ft.; containing, 201.6 cu. yds. concrete; 7,830 lbs. steel; cost per ft., \$68.80; per cu. yd. \$11.60	2,338.28
Steel I-beam bridges: No. built, 6; Total length, 162 ft.; containing 530.6 cu. yds. concrete; 72,220 lbs. steel; cost per ft., \$38.75	6,280.07
Steel truss bridges: No. built, 1; Total length, 50 ft.; containing 100.0 cu. yds. concrete; 22,900 lbs. steel; cost per ft., \$43.30	2,163.85
Substructures only: No. built, 1; containing 159.8 cu. yds.; Total cost	1,286.40
Total No. bridges built, 11; Total length, 246 ft.; total expenditures	12,068.60
Balance carried forward	11,285.81

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$12,051.06; Local, \$16,580.64; County, \$16,580.64; State, \$7,753.45; Advanced, \$4,272.01; Other, \$4,789.58; Total	\$62,027.38
Mileage: Surfaced not graded, 0.42 miles; Graded not surfaced, 12.00 miles; Total 12.42 miles; Approximate number roads built, 17	
Grading: 12.00 miles at \$2,000 per mile; 63,000 cu. yds. earth moved at 41 cts. per cu. yd.; average excavation per mile, 5,250 cu. yds.	26,256.33
Culverts: 41 conc. culverts; 420.0 cu. yds. conc. at \$9.23 per cu. yd.	3,881.78
4 metal culverts	210.86
Total cost per mile of all culverts, \$341	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.42 miles at \$4,380; 6,553 sq. yds. at 82 cts.	3,885.57
Miscellaneous Items:	
Right of way purchased	1,950.00
Clearing and grubbing	2,604.54
Total cost per mile of all miscellaneous items, \$380	
Total expenditures for 1917 road construction	38,789.08
Balance carried forward (after deducting advances) ..	18,966.29

VERNON COUNTY**1917 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1916, \$11,285.81; Local, \$5,142.80; County, \$5,142.80; State, \$2,404.86; Total	\$23, 976.27
Reinforced concrete slab and girder bridges: No built, 2; Total length, 60 ft.; containing, 236.5 cu. yds. concrete; 16,620 lbs. steel; cost per ft., \$72.30; per cu. yd., \$18.25	4, 318.70
Steel I-beam bridges: No. built, 3; Total length, 60 ft.; containing 292.0 cu. yds. concrete; 22,750 lbs. steel; cost per ft., \$113.45	6, 807.65
Steel truss bridges: No. built, 3; Total length, 250 ft.; containing 656.9 cu. yds. concrete; 144,910 lbs. steel; cost per ft., \$62.50	15, 615.83
Total No. bridges built, 8; Total length, 370 ft.; total expenditures	26, 742.18
Deficit carried forward	2, 765.91

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	86, 003.65
Expenditures for state aid road construction	38, 789.08
Expenditures for state aid bridge construction	26, 742.18
Total state aid expenditures	65, 531.26
Balance available for 1918 (after deducting advances of \$4,272.01)	16, 200.38
Total appropriation for 1918 road and bridge construction	45, 007.17
Amount available 1918	61, 207.55

VILAS COUNTY

This county has not expended as heavily in recent years as in former years, when bond issues were available. Construction is good and the maintenance is good.

The county organization is dealing well with a difficult maintenance problem and the county fully realizes the importance to it of maintaining its system of roads well for the intense summer traffic.

VILAS COUNTY**1916 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1915, \$8,025.39; County, \$14,500.00; State, \$2,079.75; Advanced, \$1,000.00; Other, \$2,695.68; Total	\$28, 300.82
Mileage: Graded and surfaced, 3.79 miles; Graded not surfaced, 18.96 miles; Total 22.75 miles; Approximate number roads built, 4	
Grading: 22.75 miles at \$654 per mile; 51,855 cu. yds. earth moved at 29 cts. per cu. yd.; average excavation per mile, 2,280 cu. yds.	14, 886.63



FIG. 1. A rear view of a Topp-Stewart 4 Wheel Drive tractor, pulling two heavy road drags. Vilas County has operated three of these tractors on their maintenance work during the past season. Their work has been very satisfactory and at a cost that compares favorably with team patrol costs in other counties.



FIG. 2. A view in Vilas County showing the operation of two graders pulled by a Holt Caterpillar tractor. Each grader is started at its respective ditch line and worked towards the center until they meet as shown. Many miles have been graded in this manner in Vilas County during 1918 at a very reasonable cost.



VILAS COUNTY

Culverts: 27 metal culverts	\$1,021.24
Total cost per mile of all culverts, \$35	
Surfacing: (Cost per mile given is based on 5 ft. width of surfacing)	
Nonpermanent types of surfacings: 3.79 miles	1,840.20
Miscellaneous Items:	
Clearing and grubbing	4,160.55
Ditching and draining	371.75
Miscellaneous	164.89
Total cost per mile of all miscellaneous items, \$206	
Total expenditures for 1916 road construction	22,445.26
Balance carried forward (after deducting advances)..	4,855.56

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$2,162.00; Total	\$2,162.00
Balance carried forward	2,162.00

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$4,855.56; County \$6,000.00; State, \$2,007.39; Advanced, \$1,000.00; Other, \$8,057.50; Total	\$21,920.45
Mileage: Surfaced not graded, 0.20 miles; Graded not surfaced, 16.82 miles; Total, 17.02 miles; Approximate number roads built, 4	
Grading: 16.82 miles at \$565 per mile; 31,285 cu. yds. earth moved at 30 cts. per cu. yd.; average excavation per mile, \$1,860 cu. yds.	9,509.30
Culverts	537.72
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 0.20 miles at \$470 per mile	281.00
Miscellaneous Items:	
Clearing and grubbing	4,705.26
Total cost per mile of all miscellaneous items, \$280	
Total expenditures for 1917 road construction	15,033.28
Balance carried forward (after deducting advances)..	5,887.17

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$2,162.00; Total	\$2,162.00
Balance carried forward	2,162.00

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917	\$24,082.45
Expenditures for state aid road construction	15,033.28
Total state aid expenditures	15,033.28
Balance available for 1918 (after deducting advances of \$1,000.00)	8,049.17
Total appropriation for 1918 road and bridge construction	16,619.35
Amount available 1918	24,668.52

WALWORTH COUNTY

This county has been making consistent progress, but due to the extremely heavy traffic the results from its stone and gravel macadam roads have not met local expectations. Both construction and maintenance, have been excellent.

The local tendency is to turn to concrete roads as the proper type under their conditions. The fact, however, that concrete is an expensive type of road, hardly possible to finance without bond issue, has and will interfere with this policy.

Sentiment is developing in this county and much further progress may be expected.

WALWORTH COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$20,268.42; Local, \$14,400.00; County, \$16,154.30; State, \$15,277.16; Other, \$63.52; Total	\$66,163.39
Mileage: Graded and surfaced, 8.41 miles; Graded not surfaced, 0.49 miles; Total, 8.90 miles; Approximate number roads built 20	
Grading: 8.90 miles at \$936 per mile; 17,500 cu. yds. earth moved at 48 cts. per cu. yd.; average excavation per mile, 1,965 cu. yds.	8,333.73
Culverts: 28 conc. culverts; 285.2 cu. yds. conc. at \$9.50 per cu. yd.	2,740.42
Total cost per mile of all culverts, \$308	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 5.04 miles at \$3,560; 28,187 sq. yds. at 67 cts.	18,997.76
Crushed gravel: 1.65 miles at \$3,435; 8,733 sq. yds. at 64 cts.	5,663.61
Pit run gravel: 1.72 miles at \$1,372; 9,084 sq. yds. at 26 cts.	2,356.17
Oil	96.00
Miscellaneous Items:	
Clearing and grubbing	66.12
Tile underdrain	414.42
Guard rail: 1,128 lin. ft. at 30 cts. per lin. ft.	342.86
Ditching and draining	154.80
Miscellaneous	401.49
Total cost per mile of all miscellaneous items, \$155	
Total expenditures for 1916 road construction	39,567.38
Balance carried forward	26,596.01

WALWORTH COUNTY**1916 STATE AID BRIDGE CONSTRUCTION**

Funds Available: Balance 1915, \$1,445.13; Local, \$1,-883.00; County, \$1,883.00; State, \$1,883.00; Total..	\$7, 094.13
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 56 ft.; containing 244.5 cu. yds. concrete; 12,500 lbs. steel; cost per ft., \$58.10; per cu. yd., \$13.30	
Total No. bridges built, 4; Total length, 56 ft.; Total expenditures	3, 253.00
Balance carried forward	3, 841.13

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$26,596.01; Local, \$22,-400.00; County, \$22,400.00; State, \$16,602.86; Other, \$200.86; Total	\$88, 199.73
Net amount transferred from bridge fund	99.26
Net total available for road construction	88, 298.99
Mileage: Graded and surfaced, 13.51 miles; Surfaced not graded, 0.20 miles; Graded not surfaced, 0.52 miles; Total, 14.23 miles; Approximate number roads built, 25	
Grading: 14.03 miles at \$1,364 per mile; 34,731 cu. yds. earth moved at 51 cts. per cu. yd.; average excavation per mile, — cu. yds.	17, 712.99
Culverts: 16 conc. culverts; 153.2 cu. yds. conc. at \$8.27 per cu. yd.	1, 267.87
Total cost per mile of all culverts, \$92	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 1.67 miles at \$3,920; 8,885 sq. yds. at 74 cts.	6, 589.37
Crushed gravel: 4.34 miles at \$4,000; 23,839 sq. yds. at 76 cts.	18, 030.52
Pit run gravel: 6.65 miles at \$1,910; 43,037 sq. yds. at 36 cts.	15, 586.00
Brick: 1.05 miles; 6,323 sq. yds. (incomplete)	9, 633.89
Miscellaneous Items:	
Clearing and grubbing	143.41
Tile underdrain	26.70
Guard rail: 828 lin. ft. at 24 cts. per lin ft.	241.87
Miscellaneous	41.62
Total cost per mile of all miscellaneous items, \$323	
Total expenditures for 1917 road construction.....	69, 274.24
Balance carried forward	19, 024.75

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$3,841.13; Local, \$750.00; County, \$750.00; State, \$555.90; Total.....	\$5, 897.03
Net amount transferred to road fund	99.26
Net total available for bridge construction	5, 797.77
Balance carried forward	5, 797.77

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917	\$94,096.76
Expenditures for state aid road construction	69,274.24
Total state aid expenditures	69,274.24
Balance available for 1918	24,822.52
Total appropriation for 1918 road and bridge construction	68,383.44
Amount available 1918	93,205.96

WASHBURN COUNTY

Starting slowly this county has rapidly gained momentum until it is well up with the neighboring counties. Construction is good, and maintenance likewise good. Adverse soil conditions and lack of proper surfacing materials greatly handicap the work.

Local sentiment is well supporting the work and further progress may be expected.

WASHBURN COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$1,820.98; Local \$8,200.00 County, \$8,200.00; State, \$2,456.22; Other, \$6,687.97; Total	\$27,365.17
Mileage: Graded and surfaced, 0.56 miles; Graded not surfaced, 11.76 miles; Total, 12.32 miles; Approximate number roads built, 18	
Grading: 12.32 miles at \$1,516 per mile; 50,330 cu. yds. earth moved at 37 cts. per cu. yd.; average excavation per mile, 4,085 cu. yds.	18,672.49
Culverts: 10 conc. culverts; 106.3 cu. yds. conc. at \$9.12 per cu. yd.	967.79
11 metal culverts	251.68
Total cost per mile of all culverts, \$100	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 0.56 miles	440.00
Miscellaneous Items.	
Clearing and grubbing	1,148.31
Guard rail: 360 lin. ft. at 12 cts. per lin. ft.	44.00
Ditching and draining	217.12
Miscellaneous	200.30
Total cost per mile of all miscellaneous items, \$139	
Total expenditures for 1916 road construction	21,941.69
Balance carried forward (after deducting advances) ..	5,423.48

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1915 \$988.20; Local, \$250.00; County, \$250.00; State, \$74.88; Total Deficit	\$413.32
Deficit carried forward	413.32

WASHBURN COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$5,423.48; County, \$29,196.21; State, \$2,803.79; Total	\$37, 423. 48
Mileage: Graded not surfaced, 7.69 miles; Total, 7.69 miles; Approximate number roads built, 12	
Grading: 7.69 miles at \$1,490 per mile; 33,330 cu. yds. earth moved at 34 cts. per cu. yd.; average excavation per mile, 4,330 cu. yds.	11, 450. 47
Culverts: 1 conc. culvert; 11.0 cu. yds. conc. at \$11.20 per cu. yd.	123. 82
5 metal culverts	266. 75
Total cost per mile of all culverts, \$51	
Miscellaneous Items:	
Clearing and grubbing	1, 227. 96
Miscellaneous	91. 95
Total cost per mile of all miscellaneous items, \$171	
Total expenditures for 1917 road construction	13, 160. 94
Balance carried forward	24, 262. 54

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$413.32; Deficit.....	\$413. 32
Deficit carried forward	413. 32

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917	\$37, 010.16
Expenditures for state aid road construction	13, 160. 94
Total state aid expenditures	13, 160. 94
Balance available for 1918	23, 849. 22
Total appropriation for 1918 road and bridge construction	6, 793. 07
Amount available 1918	30, 642. 29

WASHINGTON COUNTY

This county is still in an unsatisfactory condition, both as regards the amount of work financed each year and local sentiment.

For the past two years the county has been simply drifting, by no means keeping pace with the intense development of road traffic through its confines. Again it is probably a case of the active local people not showing sufficient interest in county road development. Some drastic change must occur in road sentiment and appropriations in this county if its roads are to be kept passable. The work done has been fair and the maintenance is fair, but all in all this county must be classed as still in an unsatisfactory general condition.

WASHINGTON COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1915, \$2,258.65; Local, \$8,-300.00; County, \$8,300.00; State, \$8,300.00; Advanced, \$3,000.00; Other, \$227.81; Total	\$25,869.16
Mileage: Graded and surfactd, 4.02 miles; Surfaced not graded, 0.05 miles; Graded not surfaced, 1.63 miles; Total, 5.70 miles; Approximate number roads built, 10	
Grading: 5.65 miles at \$1,123 per mile; 14,067 cu. yds. earth moved at 45 cts. per cu. yd.; average excavation per mile, 2,490 cu. yds.	6,343.45
Culverts: 14 conc. culverts; 158.0 cu. yds. conc. at \$7.85 per cu. yd.	1,241.87
2 metal culverts	40.00
Total cost per mile of all culverts, \$226	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed gravel: 3.41 miles at \$2,390; 18,780 sq. yds. at 45 cts.	9,437.72
Pit run gravel: 0.66 miles at \$2,170; 3,500 sq. yds at 41 cts.	1,431.34
Miscellaneous Items:	
Ditching and draining	59.35
Miscellaneous	9.42
Total cost per mile of all miscellaneous items, \$12	
Total expenditures for 1916 road construction	18,563.15
Balance carried forward (after deducting advances).	4,306.01

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$415.00; Total	\$415.00
Balance carried forward	415.00

WASHINGTON COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$4,306.01; Local \$9,- 600.00; County, \$9,600.00; State, \$9,600.00; Ad- vanced, \$7,279.47; Other, \$215.04; Total	\$40,600.52
Net amount transferred from bridge fund	150.00
Net total available for road construction	40,750.52
Mileage: Graded and surfaced, 4.28 miles; Surfaced not graded, 0.70 miles; Graded not surfaced, 0.21 miles; Total, 5.19 miles; Approximate number roads built, 12	
Grading: 4.49 miles at \$1,310 per mile; 12,065 cu. yds. earth moved at 49 cts. per cu. yd.; average excava- tion per mile, 2,680 cu. yds.	5,891.64
Culverts: 5 conc. culverts; 6.55 cu. yds. conc. at \$10.00 cu. yd.	655.41
Total cost per mile of all culverts, \$146	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 0.45 miles at \$4,200; 2,400 sq. yds. at 78 cts.	1,890.40
Crushed gravel: 4.02 miles at 2,910; 26,444 sq. yds. at 55 cts.	14,563.54
Pit run gravel: 0.51 miles at \$1,480; 2,700 sq. yds. at 28 cts.	754.57
Oil application	511.05
Miscellaneous Items:	
Clearing and grubbing	126.00
Guard rail: 752 lin. ft. at 20 cts. per lin. ft.	147.74
Total cost per mile of all miscellaneous items, \$61	
Total expenditures for 1917 road construction	24,540.43
Balance carried forward (after deducting advances) ..	8,930.62

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$415.00; Local, \$250.00; County, \$250.00; State, \$250.00; Total...	\$1,165.00
Net amount transferred to road fund	150.00
Net total available for bridge construction	1,015.00
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 14 ft.; containing 53.9 cu. yds. con- crete, 2,760 lbs. steel; cost per ft., \$57.10; per cu. yd., \$14.85	\$800.00
Total No. bridges built, 1; Total length, 14 ft.; Total ex- penditures	800.00
Balance carried forward	215.00

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917	\$41,765.52
Expenditures for state aid road construction	24,540.43
Expenditures for state aid bridge construction	800.00
Total state aid expenditures	25,340.43
Balance available for 1918 (after deducting advances of \$7,279.47)	9,145.62
Total appropriation for 1918 road and bridge construc- tion	39,705.98
Amount available 1918	48,851.60

WAUKESHA COUNTY

This county has built a considerable mileage of stone and gravel macadam roads. Traffic on many of its roads is very heavy due to the location of the county, and the problem of maintaining the present inadequate surfaces under the traffic has been extremely difficult.

This has been complicated by the further fact that labor is high and almost impossible to secure. The county organization has tried hard to overcome the tremendous handicaps and the State Highway Commission feels that rather than deserving the censure it has received it has worked hard to meet an almost impossible task.

The burden of maintaining the present type of road is too heavy. The roads in this county will never be satisfactory until many of them are built of concrete or brick. This means for this county a bond issue, and conditions are not ripe for this either under general conditions or considering only local sentiment.

The county board will have to make very large maintenance appropriations and expect only fair roads until the system can be built of a higher type of construction. No other conclusion is possible under the existing conditions.

WAUKESHA COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$7,616.07; Local, \$30,389.00; County, \$30,389.00; State, \$13,330.37; Other, \$1,191.67; Total	\$82,916.11
Mileage: Graded and surfaced, 9.86 miles; Surfaced not graded, 0.93 miles; Graded not surfaced, 1.95 miles; Total, 12.74 miles; Approximate number roads built, 17	
Grading: 11.81 miles at \$747 per mile; 24,387 cu. yds. earth moved at 37 cts. per cu. yd.; average excavation per mile, 2,064 cu. yds.	9,131.62
Culverts: 25 conc. culverts; 287.0 cu. yds. conc. at \$7.65 per cu. yd.	2,197.80
1 culvert repaired	24.00
Total cost per mile of all culverts, \$188	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 2.50 miles at \$1,925; 14,800 sq. yds. at 36 cts.	5,385.76
Crushed gravel: 7.17 miles at \$2,226; 42,983 sq. yds. at 42 cts.	19,889.27
Pit run gravel: 1.12 miles at \$1,232; 5,900 sq. yds. at 23 cts.	1,378.54

WAUKESHA COUNTY**Miscellaneous Items:**

Clearing and grubbing	\$306.78
Tile underdrain	26.60
Ditching and draining	571.37
Total cost per mile of all miscellaneous items, \$77	
Total expenditures for 1916 road construction	38,911.74
Balance carried forward	44,004.37

NOTE: 1916 expenditures on Blue Mound road in town of Brookfield to be reported in 1918. (Road incomplete)

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1915, \$463.22; Local, \$7,500.00; County, \$7,500.00; State, \$3,289.93; Total	\$17,826.71
Reinforced concrete slab and girder bridges: No. built, 5; Total length, 226 ft.; containing 768.8 cu. yds. concrete; 36,560 lbs. steel; cost per ft., \$54.80; per cu. yd., \$16.10	12,379.30
Reinforced concrete arch bridges: No. built, 1; Total length, 45 ft.; containing 509.0 cu. yds. concrete; 19,730 lbs. steel; cost per ft., \$132.10; per cu. yd., \$11.70	5,943.93
Total No. bridges built, 6; Total length, 271 ft.; Total expenditures	18,323.23
Deficit carried forward	496.52

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$44,004.37; County, \$44,459.86; State, \$16,940.14; Other, \$23,495.40; Total..	\$128,899.77
Mileage: Graded and surfaced, 11.73 miles; Surfaced not graded, 0.59 miles; Graded not surfaced, 1.55 miles; Total, 13.87 miles; Approximate number roads built, 11	
Grading: 13.28 miles at \$1,168 per mile; 25,055 cu. yds. earth moved at 40 cts. per cu. yd.; average excavation per mile, 1,886 cu. yds.	10,128.77
Culverts: 22 conc. culverts; 241.9 cu. yds. conc. at \$9.45 per cu. yd.	2,287.55
2 culverts repaired	113.00
Total cost per mile of all culverts, \$180	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 3.43 miles at \$3,520; 20,966 sq. yds. at 67 cts.	13,986.00
Crushed gravel: 6.12 miles at \$2,620; 49,814 sq. yds. at 50 cts.	24,825.71
Pit run gravel: 2.77 miles at \$2,720; 14,600 sq. yds. at 52 cts.	7,525.66



FIG. 1. A properly surface treated and well maintained 9-ft. gravel road, Waukesha County. This road is giving excellent service.



FIG. 2. An arch bridge on State Trunk Highway No. 12 near Oshkosh. The span is 40 ft., roadway 22 ft. The road rises toward the bridge from both directions and the curve in the bridge rail is necessary to fit the vertical curve in the road. A modern highway bridge.



FIG. 3. A plate girder bridge over the Fox River in the village of Omro, Winnebago County. The total length is 375 ft., the roadway 20 ft., the width of sidewalk 6 ft. Cost \$37,112. The span in the foreground is raised to permit the passage of boats giving a clear opening of 70

WAUKESHA COUNTY

Miscellaneous Items:

Clearing and grubbing	\$118.65
Tile underdrain	47.61
Total cost per mile of all miscellaneous items, \$12	
Total expenditures for 1917 road construction.....	59,032.95
Balance carried forward	69,866.82
The figures above do not include 1916 and 1917 construction on the Blue Mound Road in the Town of Brookfield. An estimate of the amount of work performed is as follows:	
(27,300 ft.) 15,694 cu. yds. grading at 47c	\$7,376.18
(27,300 ft.) 45,500 sq. yds. surfacing (crushed gravel) at 57c	25,935.00
(18) 265.45 cu. yds. culverts at \$8.50	2,256.32
4.86 cu. yds. culverts (extra) at \$8.50	37.06
10.0 cu. yds. gravel on tile line at \$1.70	17.00
5,273 lin. ft. tile at 10c	527.30
Total	36,148.86

This work will be reported in detail in the 1918 reports.

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$496.52; Total deficit....	\$496.52
Deficit carried forward	496.52

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$128,403.25
Expenditures for state aid road construction	59,032.95
Total state aid expenditures	59,032.95
Balance available for 1918	69,370.30
Total appropriation for 1918 road and bridge construction	39,201.42
Amount available 1918.....	108,571.72

WAUPACA COUNTY

This county is proceeding as in the past. Construction is good on the average, and maintenance until late in the summer poor. General road sentiment is only lukewarm and only the county board is giving good support. This county, like some others, has not yet awakened to the immensity of the road problem facing it, but is rather inclined to drift along without realizing that times and modes of travel have changed, and will continue to change with lightning rapidity.

WAUPACA COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$19,277.53; Local, \$18,-900.00; County, \$18,900.00; State, \$10,319.10; Advanced, \$800.00; Other, \$150.00; Total	\$68,346.63
Mileage: Graded and surfaced, 15.81 miles; Surfaced not graded, 4.37 miles; Graded not surfaced, 2.46 miles; Total, 22.64 miles; Approximate number roads built, 29	
Grading: 18.27 miles at \$1,100 per mile; 55,806 cu. yds. earth moved at 36 cts. per cu. yd.; average excavation per mile, 3050 cu. yds.	20,366.90
Culverts: 47 conc culverts; 469.6 cu. yds. conc. at \$7.59 per cu. yd.	3,564.32
1 metal culvert; 1 culvert repaired	131.80
Total cost per mile of all culverts, \$202	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed Stone: 6.73 miles at \$2,680; 37,348 sq. yds. at 50 cts.	18,899.41
Pit run gravel: 13.12 miles at \$870; 76,770 sq. yds. at 16 cts.	12,638.34
Concrete: 0.33 miles at \$8,000; 2,887 sq. yds. at \$1.45..	4,186.12
Miscellaneous Items:	
Right of way purchased	100.00
Clearing and grubbing	520.35
Guard rail: 250 lin. ft. at 16 cts. per lin. ft.	48.05
Miscellaneous	16.03
Total cost per mile of all miscellaneous items, \$54	
Total expenditures for 1916 road construction	60,765.77
Balance (after deducting advances)	6,780.86
Amount to be deducted from above balance (Clintonville, \$7,500.00; New London, \$9,000.00)	16,500.14
Deficit carried forward	9,719.25

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$103.32; Total	\$103.32
Balance carried forward	103.32

WAUPACA COUNTY

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Deficit 1916, \$9,719.28; Local, \$3,-050.00; County, \$52,046.86; State, \$10,692.25; Other, \$160.06; Total	\$56, 229.89
Mileage: Graded and surfaced, 8.31 miles; Surfaced not graded, 0.89 miles; Graded not surfaced, 3.44 miles; Total, 12.64 miles; Approximate number roads built, 13	
Grading: 11.75 miles at \$945 per mile; 27,866 cu. yds. earth moved at 40 cts. per cu. yd.; average excavation per mile, 2,370 cu. yds.	11, 108.49
Culverts: 12 conc. culverts; 136. 4 cu. yds. conc. at \$9.75 per cu. yd.	1, 329.28
2 metal culverts	153.94
Total cost per mile of all culverts, \$126	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 3.37 miles at \$2,840; 17,790 sq. yds. at 54 cts.	9, 574.82
Crushed gravel: 3.52 miles at \$1,920; 18,610 sq. yds. at 36 cts.	7, 094.72
Pit run gravel: 2.31 miles at \$1,760; 12,180 sq. yds. at 33 cts.	5, 333.63
Miscellaneous Items:	
Right of way purchased	375.00
Clearing and grubbing	4, 124.97
Guard rail: 250 lin. ft. at 16 cts. per lin. ft.	48.05
Ditching and draining	300.00
Riprap	99.30
Miscellaneous	102.95
Total cost per mile of all miscellaneous items, \$430	
Total expenditures for 1917 road construction	39, 645.15
Balance carried forward	16, 584.74

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$103.32; Total	\$103.32
Balance carried forward	103.32

STATEMENT JANUARY 1, 1918.

Funds available for road and bridge construction, 1917..	\$56, 333.21
Expenditures for state aid road construction	39, 645.15
Total state aid expenditures	39, 645.15
Balance available for 1918	16, 688.06
Total appropriation for 1918 road and bridge construction	25, 013.63
Amount available 1918	41, 701.69

WAUSHARA COUNTY

This county has proceeded only moderately fast and due to difficult material conditions the mileage so far built is small. The construction is excellent and maintenance good.

There is no great lack of local support but seemingly no great local enthusiasm. It will take drastic action by the more prominent citizens if the county is to meet the road conditions now prevailing. The work done is good but there is not nearly enough of it.

WAUSHARA COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$6,024.90; Local, \$7,-350.00; County, \$7,350.00; State, \$5,450.40; Advanced, \$827.13; Other, \$2,684.94; Total	\$29, 687.37
Mileage: Graded and surfaced, 5.05 miles; Surfaced not graded, 1.61 miles; Graded not surfaced, 3.35 miles; Total, 10.01 miles; Approximate number roads built, 20	
Grading: 8.40 miles at \$430 per mile; 18,250 cu. yds. earth moved at 19 cts. per cu. yd.; average excavation per mile, 2,170 cu. yds.	3, 605.39
Culverts: 12 conc. culverts; 134.3 cu. yds. conc. at \$7.46 per cu. yd.	1, 002.70
2 metal culverts; 1 culvert repaired	71.51
Total cost per mile of all culverts, \$128	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 3.75 miles at \$3,130; 19,833 sq. yds. at 59 cts.	11, 731.13
Pit run gravel: 2.69 miles at \$1,134; 14,190 sq. yds. at 21 cts.	3, 051.80
Concrete: 0.22 miles at \$5,670; 3,233 sq. yds. at \$1.07	3, 475.89
Oil: 3,120 sq. yds. at 4 cts.	132.48
Miscellaneous Items:	
Clearing and grubbing	143.70
Curb and gutter	1, 029.19
Miscellaneous	393.02
Total cost per mile of all miscellaneous items, \$181	
Total expenditures for 1916 road construction	24, 636.81
Balance carried forward (after deducting advances) ..	4, 223.43

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$2.60; Local, \$300.00; County, \$300.00; State, \$222.45; Total	\$825.05
Reinforced concrete slab and girder bridges: No. built, 1; Total length, 24 ft.; containing 110.3 cu. yds. concrete; 4,910 lbs. steel; cost per ft., \$47.75; per cu. yd., \$10.40	1, 145.00
Steel I-beam bridges: No. built, 1; Total length, 16 ft.; containing 58.2 cu. yds. concrete; 4,990 lbs. steel; cost per ft., \$42.75	684.00
Total No. bridges built, 2; Total length, 40 ft.; Total ex-	

WAUSHARA COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Balance 1916, \$4,223.43; Local, \$17,- 970.00; County, \$17,970.00; State, \$5,320.10; Ad- vanced, \$3,926.15; Other, \$377.80; Total	\$49,787.48
Mileage: Graded and surfaced, 8.86 miles; Surfaced not graded, 0.83 miles; Graded not surfaced, 2.39 miles; Total, 12.08 miles; Approximate number roads built, 21	
Grading: 11.25 miles at \$435 per mile; 22,717 cu. yds. earth moved at 22 cts. per cu. yd; average excava- tion per mile ,2,040 cu. yds.	4,891.56
Culverts: 10 conc. culverts, 96.6 cu. yds. conc. at \$8.60 per cu. yd.	831.33
1 culvert repaired	7.00
Total cost per mile of all culverts, \$74	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 3.14 miles at \$3,590; 17,258 sq. yds. at 68 cts.	12,402.41
Pit run gravel: 6.44 miles at \$1,420; 33,995 sq. yds. at 27 cts.	9,159.80
Concrete: 0.11 miles at 8,940; 1,192 sq. yds. at \$1.70..	2,020.91
Miscellaneous Items:	
Right of way purchased	62.50
Clearing and grubbing	703.80
Guard rail: 1,549 lin. ft. at 7 cts. per lin. ft.	106.25
Ditching and draining	20.00
Riprap	10.05
Miscellaneous	13.60
Total cost per mile of all miscellaneous items, \$81	
Total expenditures for 1917 road construction	30,229.21
Balance (after deducting advances)	15,632.12
Returned to village	330.84
Balance carried forward	15,301.28

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1916, \$1,003.95; Local, \$1,- 500.00; County, \$1,500.00; State, \$444.07; Total ..	\$2,440.12
Reinforced concrete slab and girder bridges: No. built, 3; Total length, 52 ft.; containing 216.0 cu. yds. con- crete; 11,630 lbs. steel; cost per ft., \$60.60; per cu. yd., \$14.60	3,150.00
Steel I-beam bridges: No. built, 1; Total length, 20 ft.; containing 6.3 cu. yds. concrete; 5,660 lbs. steel; cost per ft., \$22.50	450.00
Total No. bridges built, 4; Total length, 72 ft., Total ex- penditures	3,600.00
Deficit carried forward	1,159.88

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$51, 896.76
Expenditures for state aid road construction	30, 229.21
Expenditures for state aid bridge construction	3, 600.00
Total state aid expenditures	33, 829.21
Balance available for 1918 (after deducting advances of \$3,926.15)	14, 141.40
Total appropriation for 1918 road and bridge construction	44, 703.86
Amount available 1918	58, 845.26

WINNEBAGO COUNTY

Starting very slowly under the State Aid law this county did not make any progress worth mentioning for several years. During the past biennium conditions have been much improved and matters are now on a satisfactory basis. Construction has been good and the maintenance this year very good.

All in all, this county is no longer a problem, and sentiment has advanced to the point where the county board will be supported in dealing adequately with its very intense traffic difficulties.

WINNEBAGO COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$13,678.39; Local, \$8,-085.55; County, \$8,085.55; State, \$8,085.55; Advanced, \$3,300.00; Other, \$56.72; Total	\$41, 291.76
Net amount transferred to bridge fund	945.63
Net total available for road construction	40, 346.13
Mileage: Graded and surfaced, 3.77 miles; Surfaced not graded, 0.04 miles; Graded not surfaced, 2.88 miles; Total, 6.69 miles; Approximate number roads built, 11	
Grading: 6.65 miles at \$723 per mile; 12,728 cu. yds. earth moved at 38 cts. per cu. yd. average excavation per mile, 1,910 cu. yds.	4, 813.16
Culverts: 15 conc. culverts; 189.4 cu. yds. conc. at \$9.63 per cu. yd.	1, 846.57
1 metal culvert; 2 culverts repaired	29.02
Total cost per mile of all culverts, \$282	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 2.66 miles at \$2,450; 15,450 sq. yds. at 46 cts.	8, 593.48
Pit run gravel: 0.38 miles at \$3,080; 2,000 sq. yds. at 59 cts.	1, 343.68
Concrete: 0.77 miles at \$7,760; 6,479 sq. yds. at \$1.47	9, 531.36
Oil: 4,667 sq. yds. at 6 cts.	263.06

WINNEBAGO COUNTY**Miscellaneous Items:**

Clearing and grubbing	\$119.97
Tile underdrain	502.55
Ditching and draining	487.72
Miscellaneous	25.96
Total cost per mile of all miscellaneous items, \$171	
Total expenditures for 1916 road construction	27,556.53
Balance carried forward (after deducting advances) ..	9,489.60

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$195.68; Local, \$12,- 650.00; County, \$12,650.00; State, \$12,650.00; Total	\$38,145.68
Net amount transferred from road fund	945.63
Net total available for bridge construction	39,091.31
Reinforced concrete slab and girder bridges: No. built, 4; Total length, 114 ft.; containing 437.2 cu. yds. con- crete; 28,510 lbs. steel; cost per ft., \$41.15; per cu. yd., \$10.70	
Total No. bridges built, 4; Total length, 114 ft.; Total ex- penditures	4,689.70
Balance carried forward	34,401.61

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$9,489.60; Local, \$12,- 300.00; County, \$19,073.03; State, \$16,815.35; Other, \$22.49; Total	\$57,700.47
Net amount transferred from bridge fund	1,878.33
Net total available for road construction	59,578.80
Mileage: Graded and surfaced, 1.05 miles; Surfaced not graded, 2.91 miles; Graded not surfaced, 0.44 miles; Total, 4.40 miles; Approximate number roads built, 5	
Grading: 1.49 miles at \$1,770 per mile; 1,540 cu. yds. earth moved at 51 cts. per cu. yd.; average excava- tion per mile, 1,030 cu. yds.	2,649.51
Culverts: 4 conc. culverts; 47.4 cu. yds. conc. at \$11.53 per cu. yd.	547.07
3 culverts repaired	310.19
Total cost per mile of all culverts, \$303	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Crushed stone: 2.73 miles at \$2,110; 14,400 sq. yds. at 40 cts.	6,539.04
Concrete: 1.23 miles at \$7,290; 10,907 sq. yds. at \$1.38	15,052.11
Shoulders to concrete road	396.54
Miscellaneous Items:	
Clearing and grubbing	62.35
Ditching and draining	619.75
Miscellaneous	200.10
Total cost per mile of all miscellaneous items, \$768	
Total expenditures for 1917 road construction	26,376.66
Balance carried forward	33,202.14



FIG. 1. State Trunk Highway 15, Winnebago County showing a 15-ft. stone macadam road properly maintained with a bituminous surface treatment.



FIG. 2. A view on the Sherry Mills Road, Wood County.



FIG. 3. A handsome reinforced concrete girder bridge in the Town of Cranmoor, Wood County. The spans are 40 ft., the roadway 20 ft. This type of construction is rapidly displacing steel.

WINNEBAGO COUNTY

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance, 1916, \$34,401.61; Local, \$3,-	
317.50; County, \$3,317.50; State, \$3,317.50; Total..	\$44,354.11
Net amount transferred to road fund	1,878.33
Net total available for bridge construction	42,475.78
Reinforced concrete slab and girder bridges: No. built,	
3; Total length, 59 ft.; containing 288.3 cu. yds. con-	
crete; 13,470 lbs. steel; cost per ft., \$53.85; per cu.	
yd., \$11.00	3,174.33
Reinforced concrete arch bridges: No. built, 1; Total	
length, 40 ft.; containing 267.0 cu. yds. concrete;	
8,320 lbs. steel; cost per ft., \$94.10; per cu. yd.,	
\$14.10	3,763.15
Steel plate girder bridges: No. built, 1; Total length,	
364 ft., containing 510.0 cu. yds. concrete; 420,000	
lbs. steel; cost per ft., \$102.00	37,112.10
Total No. bridges built, 5; Total length, 463 ft.; Total ex-	
penditures	44,049.58
Deficit carried forward	1,573.80

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$102,054.58
Expenditures for state aid road construction	26,376.66
Expenditures for state aid bridge construction	44,049.58
Total state aid expenditures	70,426.24
Balance available for 1918	31,628.34
Total appropriation for 1918 road and bridge construc-	
tion	47,383.23
Amount available 1918	79,011.57

WOOD COUNTY

Work in this county has not changed materially. The construction work is good and the maintenance excellent. Sentiment generally throughout the county is excellent and further advances may be expected.

All in all, results and conditions continue to be generally very satisfactory.

WOOD COUNTY

1916 STATE AID ROAD CONSTRUCTION

Funds Available, Deficit 1915, \$3,681.64; Local, \$19,450.00; County, \$24,450.00; State \$8,367.45; Other, \$625.36; Total	\$49,211.17
Mileage: Graded and surfaced, 4.31 miles; Surfaced not graded, 3.17 miles; Graded not surfaced, 21.86 miles; Total, 29.34 miles; Approximate number roads built, 29	
Grading: 26.17 miles at \$856 per mile; 72,100 cu. yds. earth moved at 31 cts. per cu. yd.; average excavation per mile, 2,750 cu. yds.	22,417.85
Culverts: 27 conc. culverts; 307.0 cu. yds. conc. at \$7.83 per cu. yd.	2,407.91
10 metal culverts; 2 culverts repaired	390.68
Total cost per mile of all culverts, \$106	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 3.64 miles at \$1,050 per mile	4,381.61
Crushed stone: 1.31 miles at \$3,415; 6,935 sq. yds at 64 cts.	4,924.20
Pit run gravel: 1.27 miles at \$1,875; 11,950 sq. yds. at 35 cts.	4,237.57
Concrete: 1.26 miles at \$6,860; 12,035 sq. yds. at \$1.30..	15,667.25
Oil	31.25
Shoulders to concrete road	994.83
Miscellaneous Items:	
Clearing and grubbing	713.27
Tile underdrain	385.74
Guard rail: 2,946 lin. ft. at 18 cts. per lin. ft.	758.08
Miscellaneous	496.04
Total cost per mile of all miscellaneous items, \$90	
Total expenditures for 1916 road construction	57,806.28
Deficit carried forward	8,595.11

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Deficit 1915, \$100.39; Local, \$2,350.00; County, \$2,350.00; State, \$863.10; Total	\$5,462.71
Steel I-beam bridges: No. built, 5; Total length, 86 ft.; containing 193.9 cu. yds. concrete; 27,150 lbs. steel; cost per ft., \$28.25	
Total No. bridges built, 5; Total length, 86 ft.; Total expenditures	2,428.57
Balance carried forward	3,034.14

WOOD COUNTY**1917 STATE AID ROAD CONSTRUCTION**

Funds Available: Deficit 1916, \$8,595.11; Local, \$25,- 859.00; County, \$25,859.00; State, \$8,721.13; Ad- vanced, \$11,805.93; Other, \$25,132.38; Total	\$88,782.34
Net amount transferred from bridge fund	798.46
Net total available for road construction	\$89,580.80
Mileage: Graded and surfaced, 2.27 miles; Surfaced not graded, 0.66 miles; Graded not surfaced, 15.18 miles; Total, 18.11 miles; Approximate number roads built, 25	
Grading: 17.45 miles at \$890 per mile; 42,400 cu. yds. earth moved at 38 cts. per cu. yd.; average excava- tion per mile, 2,430 cu. yds.	16,230.98
Culverts: 24 conc. culverts; 262.4 cu. yds. conc. at \$8.88 per cu. yd.	2,330.72
3 culverts repaired	419.48
Total cost per mile of all culverts, \$158	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Concrete: 2.43 miles at \$7,700; 27,349 sq. yds. at \$1.45	47,033.90
Oil: 11,013 sq. yds. at 5 cts.	553.79
Disintegrated granite: 0.50 miles at \$3,770; 2,664 sq. yds. at 68 cts.	1,434.62
Miscellaneous Items:	
Clearing and grubbing	1,187.50
Tile underdrain	425.77
Curb and gutter	800.00
Guard rail: 944 lin. ft. at 45 cts. per lin. ft.	424.93
Ditching and draining	56.93
Miscellaneous	2,126.62
Total cost per mile of all miscellaneous items, \$287	
Total expenditures for 1917 road construction	73,025.24
Balance carried forward (after deducting advances) ..	4,749.63

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$3,034.14; Local, \$3,- 075.00; County, \$3,075.00; State, \$1,037.07; Total..	\$10,221.21
Net amount transferred to road fund	798.46
Net total available for bridge construction	9,422.75
Reinforced concrete slab and girder bridges: No. built, 6; Total length, 178 ft.; containing 599.4 cu. yds. con- crete; 39,530 lbs. steel; cost per ft., \$60.20; per cu. yd., \$17.90	
Total No. bridges built, 6; Total length, 178 ft.; Total ex- penditures	10,704.46
Deficit carried forward	1,281.71

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917..	\$99,003.55
Expenditures for state aid road construction	73,025.24
Expenditures for state aid bridge construction	10,704.46
Total state aid expenditures	83,729.70
Balance available for 1918 (after deducting advances of \$11,805.93)	3,467.92
Total appropriation for 1918 road and bridge construc- tion	76,994.47
Amount available 1918	80,462.39

STATE OF WISCONSIN

1916 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1915, \$331,541.73; Local, \$913,642.72; County, \$1,562,653.17; State, \$801,800.71; Advanced, \$252,587.69; Other, \$522,849.77;	
Total	\$4, 385, 075.79
Net amount transferred to bridge fund	81, 853.56
Net total available for road construction	4, 303, 222.23
Mileage: Graded and surfaced, \$478.56 miles; Surfaced not graded, 107.01 miles; Graded not surfaced, 523.43 miles; Total, 1,109.00 miles; Approximate number roads built,——	
Grading: 1,001.99 miles at \$1,092 per mile; 3,165,236 cu. yds. earth moved at 35 cts. per cu. yd.; average excavation per mile, 3,165 cu. yds.	
	1, 093, 389.96
Culverts: 2,122 conc. culverts; 25,810.4 cu. yds. conc. at \$9.21 per cu. yd.	
	237, 920.44
298 metal culverts; 71 culverts repaired	
	19, 280.77
Total cost per mile of all culverts, \$257	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 32.52 miles at \$910 per mile	
	32, 774.51
Crushed stone: 188:64 miles at \$3.020; 1,016,338 sq. yds. at 57 cts.	
	610, 472.38
Crushed gravel: 96.45 miles at \$2,050; 545,104 sq. yds. at 39 cts.	
	212, 007.52
Pit run gravel: 169.00 miles at \$1,200; 956,067 sq. yds. at 23 cts.	
	216, 431.96
Concrete: 49.79 miles at \$7,530; 458,917 sq. yds. at \$1.44	
	661, 102.01
Sheet asphalt: 2.97 miles at \$10,600; 52,320 sq. yds. at \$2.00	
	104, 908.19
Asphaltic concrete: 0.49 miles at \$8,030; 3,800 sq. yds. at \$1.52	
	5, 776.17
Brick: 0.47 miles; 5,267 sq. yds.	
	13, 540.92
Shale: 25.31 miles at \$1,080; 137,584 sq. yds. at 20 cts.	
	28, 238.58
Iron ore: 5.46 miles at \$1,170; 30,538 sq. yds. at 22 cts.	
	6, 767.82
Slate: 0.59 miles at \$1,870; 3,120 sq. yds. at 35 cts. ...	
	1, 103.67
Disintegrated granite: 13.26 miles at \$1,610; 91,151 sq. yds. at 31 cts.	
	27, 823.91
Quarry chips: 0.62 miles at \$1,520; 3,300 sq. yds. at 28 cts.	
	942.13
Shoulders to concrete road	
	4, 961.14
Expenditures for oil	
	12, 249.56
Miscellaneous Items:	
Right of way purchased	
	25, 043.31
Clearing and grubbing	
	50, 077.53
Tile underdrain	
	6, 086.43
Curb and gutter	
	11, 337.68
Guard rail: 120,844 lin. ft. at 27 cts. per lin. ft.	
	32, 468.99
Ditching and draining	
	13, 441.53

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Riprap	\$5,941.41
Miscellaneous	55,921.97
Total expenditures for 1916 road construction.....	3,490,010.49
Balance (after deducting advances) of \$252,- 587.69	560,624.05
Miscellaneous payments made to local units, etc. (not construction)	48,998.17
Balance carried forward	511,625.88

1916 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1915, \$170,859.33; Local, \$127,234.49; County, \$133,918.36; State, \$80,- 084.89; \$20.00 credit through error in 1915 re- port; Total	\$512,117.07
Net amount transferred from road fund	81,853.56
Net total available for bridge construction	593,970.63
 Reinforced concrete slab and girder bridges: No. built, 165; Total length, 2,691 ft.; containing 12,311 cu. yds. concrete; 629,460 lbs. steel; cost per ft., \$55.35; per cu. yd., \$12.10	148,940.98
 Reinforced concrete arch bridges: No. built, 9; Total length, 699 ft.; containing 5,020 cu. yds. concrete; 238,310 lbs. steel; cost per ft., \$106.90; per cu. yd., \$14.90	74,704.13
 Steel I-beam bridges: No. built, 103; Total length, 2,343 ft.; containing 7,168 cu. yds. concrete; 909,740 lbs. steel; cost per ft., \$41.05	96,117.43
 Steel truss bridges: No. built, 16; Total length, 2,274 ft.; containing 3,274 cu. yds. concrete; 1,306,210 lbs. steel; cost per ft., \$34.70	78,881.53
 Steel plate girder bridges: No. built, 17; Total length, 1,216 ft., containing 3,153 cu. yds. concrete; 660,- 470 lbs. steel; cost per ft., \$50.00	60,785.49
 Substructures only: No. built, 3, containing 344 cu. yds.; Total cost	2,285.98
 Total No. bridges built, 313; Total length, 9,223 ft.; Total expenditures	461,715.54
Balance carried forward	132,255.09

STATE OF WISCONSIN

1917 STATE AID ROAD CONSTRUCTION

Funds Available: Balance 1916, \$511,625.88; Local, \$904,716.30; County, \$1,802,098.81; State, \$845-333.64; Advanced, \$183,708.80; Other, \$1,049,-781.06; Total	\$5,297,264.49
Net amount transferred to bridge fund	52,289.93
Net total available for road construction	5,244,974.56
Mileage: Graded and surfaced, 411.33 miles; Surfaced not graded, 115.47 miles; Graded not surfaced, 452.25 miles; Total, 979.05 miles.	
Grading: 863.58 miles at \$1,228 per mile; 2,782,177 cu. yds. earth moved at 38 cts. per cu. yd.; average excavation per mile, 3,225 cu. yds.	1,062,409.72
Culverts: 1,747 conc. culverts; 21,377.1 cu. yds. conc. at \$10.73 per cu. yd.	229,162.58
134 metal culverts; 59 culverts repaired	12,357.65
Total cost per mile of all culverts, \$281	
Surfacing: (Cost per mile given is based on 9 ft. width of surfacing)	
Nonpermanent types of surfacings: 24.17 miles at \$800 per mile	23,971.50
Crushed stone: 124.50 miles at \$3,570; 706,662 sq. yds. at 68 cts.	477,712.38
Crushed gravel: 86.06 miles at \$2,830; 491,665 sq. yds. at 53 cts.	263,358.05
Pit run gravel: 197.15 miles at \$1,390; 1,108,191 sq. yds. at 26 cts.	292,710.21
Concrete: 56.44 miles at \$8,650; 516,387 sq. yds. at \$1.64	847,112.38
Sheet asphalt: 0.25 miles at \$11,750; 7,900 sq. yds. at \$2.22	17,580.76
Sand stone block: 0.27 miles at \$22,150; 3,999 sq. yds. at \$4.19	16,772.43
Brick: 1.05 miles; 6,323 sq. yds.	9,633.89
Shale: 20.38 miles at \$1,440; 115,506 sq. yds. at 27 cts.	31,495.64
Iron ore: 1.34 miles at \$1,124; 7,100 sq. yds. at 21 cts.	1,507.05
Disintegrated granite: 15.19 miles at \$1,750; 83,653 sq. yds. at 33 cts.	28,713.52
Shoulders to concrete road	5,818.49
Expenditures for oil	11,033.40
Miscellaneous Items:	
Right of way purchased	29,857.45
Clearing and grubbing	80,598.86
Tile underdrain	8,254.83
Curb and gutter	1,444.84
Guard rail: 95,964 lin. ft. at 28 cts per lin. ft.	27,217.28
Ditching and draining	8,439.38
Riprap	4,628.25
Miscellaneous	69,348.85
Total cost per mile of all miscellaneous items, \$266	

Total expenditures for 1916 road construction	\$3,561,139.39
Balance (after deducting advances of \$183,708.80) ..	1,500,126.37
Miscellaneous payments made to local units, etc. (not construction)	69,789.67
Balance carried forward	1,430,336.70

1917 STATE AID BRIDGE CONSTRUCTION

Funds Available: Balance 1916, \$132,255.09; Local, \$136,389.44; County, \$155,767.57; State, \$74,- 961.42; Total,	\$499,373.52
Net amount transferred from road fund	52,289.93
Net total available for bridge construction	551,663.45
Reinforced concrete slab and girder bridges: No. built, 175; Total length, 3,392 ft.; containing 14,834 cu. yds. concrete; 927,480 lbs. steel; cost per ft., \$71.45; per cu. yd., \$16.35	242,318.31
Reinforced concrete arch bridges: No. built, 7; Total length, 387 ft.; containing 2,282 cu. yds. concrete; 124,050 lbs. steel; cost per ft., \$82.40; per cu yd., \$13.95	31,896.92
Steel I-beam bridges: No. built, 18; Total length, 424 ft.; containing 2,544 cu. yds. concrete; 612,990 lbs. steel; cost per ft., \$49.30	20,894.93
Steel Truss bridges: No. built, 13; Total length, 1,006 ft.; containing 2,544 cu. yds. concrete; 612,990 lbs. steel; cost per ft., \$62.85	63,241.35
Steel plate girder bridges: No. built, 4; Total length, 557 ft., containing 1,130 cu. yds. concrete; 621,770 lbs. steel; cost per ft., \$109.05	60,750.85
Substructures only: No. built, 1; containing 70 cu. yds. Total cost	968.28
Total No. bridges built, 218; Total length, 5,766 ft.; Total expenditures	420,070.64
Balance carried forward	131,592.81

STATEMENT JANUARY 1, 1918

Funds available for road and bridge construction, 1917 (after deducting \$69,789.67)	\$5,726,848.34
Expenditures for state aid road construction	3,561,139.39
Expenditures for state aid bridge construction	420,070.64
Total state aid expenditures	3,981,210.03
Balance available for 1918 (after deducting advances of \$183,708.80)	1,561,929.51
Total appropriation for 1918 road and bridge construc- tion	3,448,808.58
Amount available 1918	5,010,738.09

ALL COUNTIES

TOTAL 1916-1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 527; Total length, 8,893 ft.; containing 37,732 cu. yds. concrete; 2,095,150 lbs. steel; cost per ft., \$69.60; per cu. yd. \$16.40	\$618, 782.00
Reinforced concrete arch bridges: No. built, 9; Total length, 416 ft.; containing 2,263 cu. yds. concrete; 94,000 lbs. steel; cost per ft., \$92.80; cu. yd., \$17.05	38, 601.00
Steel I-beam bridges: No. built, 192; Total length, 4,295 ft.; containing 13,009 cu. yds. concrete; 1,602,380 lbs. steel; cost per ft., \$49.05	210, 555.00
Steel truss bridges: No. built, 46; Total length, 3,641 ft.; containing 7096 cu. yds. concrete; 1,716,530 lbs. steel; cost per ft. \$52.80	192, 174.00
Steel plate girder bridges: No. built, 9; Total length, 460 ft.; containing 1,416 cu. yd. concrete; 253,380 lbs. steel; cost per ft., \$54.30	24, 986.00
Total No. built, 783; Total length, 17,705 ft.; Total estimated cost	1, 085, 098.00

TOTAL 1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 212; Total length, 3,213 ft.; containing 13,923; cu. yds. concrete; 741,210 lbs. steel; cost per ft., \$56.40 per cu. yd., \$13.00	\$181, 205.00
Reinforced concrete arch bridges: No. built, 3; Total length, 236 ft.; containing 1,028 cu. yds. concrete; 50,410 lbs. steel; cost per ft., \$60.50 cu. yds., \$13.90	14, 275.00
Steel I-beam bridges: No. built, 172; Total length, 3,826 ft.; containing 11,325 cu. yds. concrete; 1,422,510 lbs. steel; cost per ft., \$46.80	178, 988.00
Steel truss bridges: No. built, 28; Total length, 1,691 ft.; containing 3,687 cu. yds. concrete; 856,170 lbs. steel; cost per ft., \$47.20	79, 774.00
Steel plate girder bridges: No. built 9; Total length, 460 ft.; containing 1,416 cu. yds. concrete; 253,380 lbs. steel; cost per ft., \$54.30	24, 986.00
Total No. built, 424; Total length, 9,426 ft.; Total estimated cost	479, 228.00

TOTAL 1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 315; Total length, 5,680 ft.; containing 23,809 cu. yds. concrete; 1,353,940 lbs. steel; cost per ft., \$77.05; per cu. yd. \$18.40	\$437, 577.00
Reinforced concrete arch bridges: No. built, 6; Total length, 180 ft.; containing 1,235 cu. yds. concrete; 43,590 lbs. steel; cost per ft., \$135.15; cu. yds., 1,970	24, 326.00

Steel I-beam bridges: No. built, 20; Total length, 469 ft.; containing 1,684 cu. yds. concrete; 179,870 lbs. steel; cost per ft., \$67.30	\$31,567.05
Steel truss bridges: No. built, 18; Total length, 1,950 ft.; containing 3,409 cu. yds. concrete; 860,360 lbs. steel; cost per ft., \$57.65	112,400.00
Total No. built, 359; Total length, 8,279 ft.; Total estimated cost	605,870.00

ADAMS COUNTY**1916 COUNTY AID BRIDGE CONSTRUCTION**

Steel I-beam bridges: No. built, 2; Total length, 48 ft.; containing 45.9 cu. yds. concrete; 14,940 lbs. steel; cost per ft., \$33.30	\$1,598.00
Total No. built, 2; Total length, 48 ft.; Total estimated cost	1,598.00

NO 1917 COUNTY AID BRIDGE CONSTRUCTION**ASHLAND COUNTY****1916 COUNTY AID BRIDGE CONSTRUCTION**

Steel I-beam bridges: No. built, 1; Total length, 36 ft. containing 81.2 cu. yds. concrete; 17,320 lbs. steel; cost per ft., \$54.20	\$1,950.00
Steel plate girder bridges: No. built, 1; Total length, 35 ft.; containing 96.2 cu. yds. concrete; 15,820 lbs. steel cost per ft., \$40.00	1,400.00
Total No. built, 2; Total length, 71 ft.; Total estimated cost	3,350.00

NO 1917 COUNTY BRIDGE CONSTRUCTION**BARRON COUNTY****1916 COUNTY AID BRIDGE CONSTRUCTION**

Reinforced concrete slab and girder bridges: No. built, 4; Total length, 42 ft.; containing 204.4 cu. yds. concrete; 9,230 lbs. steel; cost per ft., \$58.30; per cu. yd., \$12.00	\$2,450.00
Steel I-beam bridges: No. built, 8; Total length, 212 ft.; containing 686.0 cu. yds. concrete; 91710 lbs. steel; cost per ft., \$53.60	11,356.00
Steel truss bridges: No. built, 1; Total length, 85 ft.; containing 153.0 cu. yds. concrete; 51,230 lbs. steel cost per ft., \$50.50	4,296.00
Total No. built, 13; Total length, 339 ft.; Total estimated cost	18,102.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 8; Total length, 166 ft.; containing 617.7 cu. yds. concrete; 40,490 lbs. steel; cost per ft., \$80.70; per cu. yd., \$21.70	\$13,408.00
Reinforced concrete arch bridges: No. built, 2; Total length, 70 ft.; containing 473.0 cu. yds. concrete; 16,980 lbs. steel; cost per ft., \$125.70; cu. yd., \$18.60	8,800.00
Steel I-beam bridges: No. built, 1; Total length, 30 ft.; containing 52.9 cu. yds. concrete; 12,110 lbs. steel; cost per ft., \$43.30	1,300.00
Total No. built, 11; Total length, 266 ft.; Total estimated cost	23,508.00

BAYFIELD COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 5 ft.; containing 73.0 cu. yds. concrete; 5,960 lbs. steel; cost per ft., \$520.00; per cu. yd., \$35.65	\$2,600.00
Steel I-beam bridges: No. built, 2; Total length, 84 ft.; containing 184.0 cu. yds. concrete; 32,530 lbs. steel; cost per ft., \$37.50	3,150.00
Total No. built, 3; Total length, 89 ft.; Total estimated cost	5,750.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 48 ft.; containing 197.6 cu. yds. concrete; 12,580 lbs. steel; cost per ft., \$87.50; per cu. yd., \$21.25	\$4,200.00
Total No. built, 2; Total length, 48 ft.; Total estimated cost	4,200.00

BROWN COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 10; Total length, 186 ft.; containing 881.1 cu. yds. concrete; 50,910 lbs. steel; cost per ft., \$60.50; per cu. yd., \$12.75	\$11,250.00
Reinforced concrete arch bridges: No. built, 1; Total length, 24 ft.; containing 61.0 cu. yds. concrete; 2,850 lbs. steel; cost per ft., \$33.30; cu. yd., \$13.10	800.00
Total No. built, 11; Total length, 210 ft.; Total estimated cost	12,050.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 12; Total length, 196 ft.; containing 847.4 cu. yds. concrete; 48,660 lbs. steel; cost per ft., \$77.00; per cu. yd., \$17.80	\$15,100.00
Total No. built, 12; Total length, 196 ft.; Total estimated cost	15,100.00

BUFFALO COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. 4; Total length, 72 ft.; containing 255.7 cu. yds. concrete; 20,380 lbs. steel; cost per ft., \$51.40	\$3,700.00
Total No. built, 4; Total length, 72 ft.; Total estimated cost	3,700.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 3; Total length, 62 ft.; containing 229.1 cu. yds. concrete; 12,870 lbs. steel; cost per ft., \$83.10; per cu. yd., \$22.50	\$5,150.00
Total No. built, 3; Total length, 62 ft.; Total estimated cost	5,150.00

BURNETT COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 2; Total length, 50 ft.; containing 237.5 cu. yds. concrete; 39,540 lbs. steel; cost per ft., \$84.00	\$4,200.00
Steel plate girder bridges: No. built, 1; Total length, 60 ft.; containing 136.8 cu. yds. concrete; 27,920 lbs. steel; cost per ft., \$43.80	2,600.00
Total No. built, 3; Total length, 110 ft.; Total estimated cost	6,800.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 5; Total length, 79 ft.; containing 323.7 cu. yds. concrete; 17,590 lbs. steel; cost per ft., \$84.20; per cu. yd., \$20.55	\$6,650.00
Steel I-beam bridges: No. built, 1; Total length, 22 ft.; containing 83.2 cu. yds. concrete; 7,240 lbs. steel; cost per ft., \$72.70	1,600.00
Steel truss bridges: No. built, 1; Total length, 70 ft.; containing 151.1 cu. yds. concrete; 37,960 lbs. steel; cost per ft., \$55.70	3,900.00
Total No. built, 7; Total length, 171 ft.; Total estimated cost	12,150.00

CALUMET COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 56 ft.; containing 204.9 cu. yds. concrete; 14,120 lbs. steel; cost per ft., \$38.40; per cu. yd., \$10.50	\$2, 150.00
Total No. built, 2; Total length, 56 ft.; Total estimated cost	2, 150.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 8; Total length, 340 ft.; containing 1,330.1 cu. yds. concrete; 104,570 lbs. steel; cost per ft., \$68.50; per cu. yd., \$17.50	\$23, 300.00
Total No. built, 8; total length, 340 ft.; Total estimated cost	23, 300.00

CHIPPEWA COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 24 ft.; containing 157.1 cu. yds. concrete; 3,790 lbs. steel; cost per ft., \$75.00; per cu. yd., \$11.45	\$1, 800.00
Steel I-beam bridges: No. built, 4; Total length, 108 ft.; containing 246.8 cu. yds. concrete; 41,440 lbs. steel cost per ft., \$39.35	4, 250.00
Total No. built, 6; Total length, 132 ft.; Total estimated cost	6, 050.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 7; Total length, 102 ft.; containing 418.6 cu. yds. concrete; 18,790 lbs. steel; cost per ft., \$74.10; per cu. yds., \$18.05	\$7, 550.00
Steel I-beam bridges: No. built, 1; Total length, 32 ft.; containing 147.3 cu. yds. concrete; 17,830 lbs. steel; cost per ft., \$73.40	2, 350.00
Steel truss bridges: No. built, 2; Total length, 535 ft.; containing 503.0 cu. yds. concrete; 25,810 lbs. steel; cost per ft., \$41.55	22, 225.00
Total No. built, 10; Total length, 669 ft.; Total estimated cost	32, 125.00

CLARK COUNTY**1916 COUNTY AID BRIDGE CONSTRUCTION**

Reinforced concrete slab and girder bridges: No. built, 3; Total length, 32 ft.; containing 134.0 cu. yds. concrete; 6,230 lbs. steel; cost per ft., \$56.20; per cu. yds., \$13.45	\$1,800.00
Steel I-beam bridges: No. built, 1; Total length, 18 ft.; containing 40.1 cu. yds. concrete; 4,910 lbs. steel; cost per ft., \$36.10	650.00
Steel truss bridges: No. built, 2; Total length, 70 ft.; containing 273.9 cu. yds. concrete; 37,960 lbs. steel; cost per ft., \$63.60	4,450.00
Total No. built, 6; Total length, 120 ft.; Total estimated cost	6,900.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 12 ft.; containing 42.2 cu. yds. concrete; 1,930 lbs. steel; cost per ft., \$62.50; per cu. yd., \$17.75	\$750.00
Steel truss bridges: No. built 1; Total length, 70 ft.; containing 146.8 cu. yds. concrete; 37,990 lbs. steel; cost per ft., \$50.00	3,500.00
Total No. built: 2; Total length, 82 ft.; Total estimated cost	4,250.00

COLUMBIA COUNTY**1916 COUNTY AID BRIDGE CONSTRUCTION**

Reinforced concrete slab and girder bridges: No. built, 3; Total length, 74 ft.; containing 271.1 cu. yds. concrete; 16,740 lbs. steel; cost per ft., \$52.70; per cu. yd., \$14.40	\$3,900.00
Total No. built: 3; Total length, 74 ft.; Total estimated cost	3,900.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 30 ft.; containing 117.4 cu. yds. concrete; 6,060 lbs. steel; cost per ft., \$64.20; per cu. yd., \$16.40	\$1,925.00
Total No. built, 2; Total length, 30 ft.; Total estimated cost	1,925.00

CRAWFORD COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 1; Total length, 24 ft.; containing 59.5 cu. yds. concrete; 7,680 lbs. steel; cost per ft., \$52.10	\$1, 250.00
Total No. built, 1; Total length, 24 ft.; Total estimated cost	1, 250.00

NO 1917 COUNTY AID BRIDGE CONSTRUCTION

DANE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 27; Total length, 364 ft.; containing 1,563.4 cu. yds. concrete; 81,100 lbs. steel; cost per ft. \$61.30; per cu. yd. \$14.30	\$22, 331.00
Steel I-beam bridges: No. built, 6; Total length, 94 ft.; containing 342.2 cu. yds. concrete; 32,940 lbs. steel; cost per ft., \$54.50	5, 123.00
Total No. built, 33; Total length, 458 ft.; Total estimated cost	27, 454.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 11; Total length, 168 ft.; containing 695.5 cu. yds. concrete; 34,670 lbs. steel; cost per ft., \$66.90; per cu. yd \$16.15	\$11, 236.00
Reinforced concrete arch bridges: No. built, 1; Total length, 10 ft.; containing 100.0 cu. yds. concrete; 2,530 lbs. steel; cost per ft., \$120.60; cu. yd., \$12.05	1, 206.00
Steel I-beam bridges: No. built, 1; Total length, 13 ft.; containing 43.6 cu. yds. concrete; 2,870 lbs. steel; cost per ft., \$48.10	625.00
Total No. built, 13; Total length, 191 ft.; Total estimated cost	13, 067.00

DODGE COUNTY

NO 1916 COUNTY AID BRIDGE CONSTRUCTION

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 10 ft.; containing 53.0 cu. yds. concrete; 2,380 lbs. steel; cost per ft., \$100.00; per cu. yd., \$18.85	\$1, 000.00
Total No. built, 1; Total length, 10 ft.; Total estimated cost	1, 000.00

DOOR COUNTY

NO 1916 COUNTY AID BRIDGE CONSTRUCTION

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 12 ft.; containing 51.8 cu. yds. concrete; 2,720 lbs. steel; cost per ft., \$41.65; per cu. yd., \$9.65	\$500.00
Total No. built 1; Total length, 12 ft.; Total estimated cost	500.00

DOUGLAS COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 16 ft.; containing 68.6 cu. yds. concrete; 3,540 lbs. steel; cost per ft., \$56.30; per cu. yd., \$13.10	\$900.00
Steel I-beam bridges: No. built, 3; Total length, 68 ft.; containing 386.8 cu. yds. concrete; 37,670 lbs. steel; cost per ft., \$94.60	6,426.00
Total No. built, 4; Total length, 84 ft.; Total estimated cost	7,326.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 4; Total length, 221 ft.; containing 654.6 cu. yds. concrete; 55,090 lbs. steel; cost per ft., \$61.10; per cu. yd., \$20.65	\$13,524.00
Total No. built 4; Total length, 221 ft.; Total estimated cost	13,524.00

DUNN COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 7; Total length, 108 ft.; containing 463.6 cu. yds. concrete; 35,580 lbs. steel; cost per ft., \$57.50	\$6,208.00
Steel truss bridges: No. built, 1; Total length, 45 ft.; containing 182.5 cu. yds. concrete; 20,090 lbs. steel; cost per ft., \$55.60	2,500.00
Total No. built, 8; Total length, 153 ft.; Total estimated cost	8,708.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 8; Total length, 106 ft.; containing 446.7 cu. yds. concrete; 21,420 lbs. steel; cost per ft., \$62.30; per cu. yd., \$14.80	\$6,608.00
Steel I-beam bridges: No. built, 1; Total length, 30 ft.; containing 85.7 cu. yds. concrete; 12,260 lbs. steel; cost per ft., \$55.40	1,662.00
Total No. built, 9; Total length, 136 ft.; Total estimated cost	8,270.00

EAU CLAIRE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 6 ft.; containing 43.0 cu. yds. concrete; 2,610 lbs. steel; cost per ft., \$100.00; per cu. yd., \$13.95	\$600.00
Steel I-beam bridges: No. built, 11; Total length, 178 ft.; containing 503.1 cu. yds. concrete; 98,890 lbs. steel; cost per ft., \$55.60	9,900.00
Total No. built, 12; Total length, 184 ft.; Total estimated cost	10,500.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 9; Total length, 106 ft.; containing 574.6 cu. yds. concrete; 25,200 lbs. steel; cost per ft., \$93.90; per cu. yd., \$17.30	\$9,946.00
Steel Truss bridges: No. built, 1; Total length, 50 ft.; containing 149.1 cu. yds. concrete; 27,780 lbs. steel; cost per ft., \$86.00	4,300.00
Total No. built, 10; Total length, 156 ft.; Total estimated cost	14,246.00

FLORENCE COUNTY

NO 1916 COUNTY AID BRIDGE CONSTRUCTION

NO 1917 COUNTY AID BRIDGE CONSTRUCTION

FOND DU LAC COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length 20 ft.; containing 77.2 cu. yds. concrete; 4,370 lbs. steel; cost per ft., \$47.50; per cu. yd., \$12.30	\$950.00
Total No. built, 1; Total length, 20 ft.; Total estimated cost	950.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 36 ft.; containing 120.6 cu. yds. concrete; 6,720 lbs. steel; cost per ft., \$66.70; per cu. yd., \$19.90	\$2,400.00
Total No. built 2; Total length, 36 ft.; Total estimated cost	2,400.00

FOREST COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 34 ft.; containing 130.3 cu. yds. concrete; 6,980 lbs. steel; cost per ft., \$58.80; per cu. yd., \$15.30	\$2,000.00
Steel truss bridges: No. built, 1; Total length, 96 ft.; containing 201.4 cu. yds. concrete; 64,220 lbs. steel; cost per ft., \$65.00	6,250.00
Steel plate girder bridges: No. built, 1; Total length, 50 ft.; containing 125.8 cu. yds. concrete; 25,300 lbs. steel; cost per ft., \$48.00	2,400.00
Total No. built, 4; Total length, 180 ft.; Total estimated cost	10,650.00

NO 1917 COUNTY AID BRIDGE CONSTRUCTION

GRANT COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 4; Total length, 90 ft.; containing 356.9 cu. yds. concrete; 30,910 lbs. steel; cost per ft., \$58.90	\$5,299.00
Total No. built. 4; Total length, 90 ft.; Total estimated cost	5,299.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 4;; Total length, 60 ft.; containing 303.8 cu. yds. concrete; 16,900 lbs. steel; cost per ft., \$82.70; per cu. yd., \$16.35	\$4,963.00
Steel truss bridges: No. built 1; Total length, 80 ft.; containing 211.8 cu. yds. concrete; 45,530 lbs. steel; cost per ft., \$68.50	5,480.00
Total No. built 5; Total length, 140 ft.; Total estimated cost	10,443.00

GREEN COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 4; Total length, 50 ft.; containing 258.3 cu. yds. concrete; 13,500 lbs. steel; cost per ft., \$59.00	\$3, 450.00
Total No. built, 4; Total length 50 ft.; Total estimated cost	3, 450.00

NO 1917 COUNTY AID BRIDGE CONSTRUCTION ..

GREEN LAKE COUNTY

NO 1916 COUNTY AID BRIDGE CONSTRUCTION

NO 1917 COUNTY AID BRIDGE CONSTRUCTION ..

IOWA COUNTY

NO 1916 COUNTY AID BRIDGE CONSTRUCTION

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 16 ft.; containing 54.7 cu. yds. con- crete; 2,790 lbs. steel; cost per ft., \$56.30; per cu. yd., \$16.45	\$900.00
Steel I-beam bridges: No. built, 2; Total length, 30 ft.; containing 119.9 cu. yds. concrete; 7,700 lbs. steel, cost per ft., \$66.00	1, 980.00
Steel truss bridges: No. built, 1; Total length, 40 ft., con- taining 111.2 cu. yds. concrete; 17,020 lbs. steel; cost per ft. \$65.50	2, 620.00
Total No. built, 4; Total length, 86 ft.; Total estimated cost	5, 500.00

IRON COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel truss bridges: No. built 1; Total length, 45 ft., con- taining 101.8 cu. yds. concrete; 19,880 lbs. steel; cost per ft. \$32.50	\$1, 462.00
Total No. built, 1; Total length 45 ft.; Total estimated cost	1, 462.00

NO 1917 COUNTY AID BRIDGE CONSTRUCTION

JACKSON COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 6 ft.; containing 37.1 cu. yds. concrete; 2,430 lbs. steel; cost per ft., \$80.00; per cu. yd., \$12.95	\$480.00
Steel I-beam bridges: No. built, 7; Total length, 140 ft.; containing 416.3 cu. yds. concrete; 44,030 lbs. steel; cost per ft., \$46.80	6,545.00
Total No. built 8; Total length, 146 ft.; Total estimated cost	7,025.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 26 ft.; containing 120.6 cu. yds. concrete; 6,360 lbs. steel; cost per ft., \$98.10; per cu. yd., \$21.15	\$2,550.00
Steel I-beam bridges: No. built, 1; Total length 32 ft.; containing 91.4 cu. yds. concrete; 13,640 lbs. steel; cost per ft., \$65.60	2,100.00
Total No. built, 3; Total length, 58 ft.; Total estimated cost	4,650.00

JEFFERSON COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 5; Total length, 58 ft.; containing 290.6 cu. yds. concrete; 12,050 lbs. steel; cost per ft., \$45.60; per cu. yd., \$9.10	\$2,645.00
Steel I-beam bridges: No. built, 2; Total length, 54 ft.; containing 142.8 cu. yds. concrete; 15,760 lbs. steel; cost per ft., \$34.50	1,865.00
Total No. built, 7; Total length, 112 ft.; Total estimated cost	4,510.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 3; Total length, 34 ft.; containing 164.3 cu. yds. concrete; 8,390 lbs. steel; cost per ft., \$104.50; per cu. yd., \$21.60	\$3,550.00
Total No. built, 3; Total length 34 ft.; Total estimated cost	3,550.00

JUNEAU COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 24 ft.; containing 111.8 cu. yds. concrete; 5,310 lbs. steel; cost per ft., \$61.30; per cu. yd., \$13.15	\$1,469.00
Steel truss bridges: No. built, 3; Total length, 42 ft.; containing 161.2 cu. yds. concrete; 10,580 lbs. steel; cost per ft., \$46.30	1,945.00
Total No. built, 5; Total length, 66 ft.; Total estimated cost	3,414.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 3; Total length, 26 ft.; containing 192.9 cu. yds. concrete; 6,250 lbs. steel; cost per ft., \$152.00; per cu. yd., \$20.50	
Total No. built, 3; Total length, 26 ft.; Total estimated cost	\$3,950.00

KENOSHA COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 16 ft.; containing 84.8 cu. yds. concrete; 3,710 lbs. steel; cost per ft., \$64.00; per cu. yd., \$12.10	\$1,025.00
Steel I-beam bridges: No. built, 3; Total length, 86 ft.; containing 338.9 cu. yds. concrete; 40,140 lbs. steel; cost per ft., \$60.50	5,200.00
Total No. built, 5; Total length, 102 ft.; Total estimated cost	6,225.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 3; Total length, 26 ft.; containing 133.3 cu. yds. concrete; 6,440 lbs. steel; cost per ft., \$92.30; per cu. yd., \$18.00	
Total No. built, 3; Total length, 26 ft.; Total estimated cost	\$2,400.00

KEWAUNEE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 10; Total length, 114 ft.; containing 492.2 cu. yds. concrete; 25,750 lbs. steel; cost per ft., \$55.10; per cu. yd., \$12.70
 Total No. built, 10; Total length, 114 ft.; Total estimated cost \$6,286.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 20; Total length, 304 ft.; containing 1,346.4 cu. yds. concrete; 81,950 lbs. steel; cost per ft., \$86.90; per cu. yd., \$19.65
 Total No. built, 20; Total length, 304 ft.; Total estimated cost 26,420.00

LA CROSSE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 6; Total length, 126 ft.; containing 440.5 cu. yds. concrete; 42,980 lbs. steel; cost per ft., \$49.05 \$6,182.00
 Steel plate girder bridges: No. built, 1; Total length, 40 ft., containing 113.0 cu. yds. concrete; 19,630 lbs. steel; cost per ft., \$54.90 2,196.00
 Total No. built, 7; Total length, 166 ft.; Total estimated cost 8,378.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 9; Total length, 104 ft.; containing 502.6 cu. yds. concrete; 21,620 lbs. steel; cost per ft., \$103.80; per cu. yd., \$21.50 \$10,800.00
 Reinforced concrete arch bridges: No. built, 1; Total length, 10 ft.; containing 94.0 cu. yds. concrete; 2,400 lbs. steel; cost per ft., \$170.00; cu. yd., \$18.00 1,700.00
 Steel I-beam bridges: No. built, 5; Total length, 98 ft.; containing 577.4 cu. yds. concrete; 42,720 lbs. steel; cost per ft., \$104.70 10,250.00
 Total No. built, 15; Total length, 212 ft.; Total estimated cost 22,750.00

LAFAYETTE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 7; Total length, 84 ft.; containing 537.8 cu. yds. concrete; 21,520 lbs. steel; cost per ft., \$75.25; per cu. yd., \$11.75	\$6,315.00
Steel I-beam bridges: No. built, 3; Total length, 76 ft.; containing 208.2 cu. yds. concrete; 28,430 lbs. steel; cost per ft., \$39.00	2,961.00
Total No. built, 10; Total length, 160 ft.; Total estimated cost	9,276.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 14; Total length, 188 ft.; containing 847.3 cu. yds. concrete; 44,240 lbs. steel; cost per ft., \$82.90; per cu. yd., \$18.40	\$15,575.00
Steel truss bridges: No. built, 1; Total length, 96 ft.; containing 166.4 cu. yds. concrete; 57,760 lbs. steel; cost per ft., \$60.80	5,835.00
Total No. built, 15; Total length, 284 ft.; Total estimated cost	21,410.00

LANGLADE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete arch bridges: No. built, 1; Total length, 188 ft.; containing 777.0 cu. yds. concrete; 42,180 lbs. steel; cost per ft., \$57.30; cu. yd., \$13.90	\$10,775.00
Steel truss bridges: No. built, 1; Total length, 80 ft., containing 153.9 cu. yds. concrete; 45,330 lbs. steel; cost per ft., \$50.90	4,076.00
Total No. built, 2; Total length, 268 ft.; Total estimated cost	14,851.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 42 ft.; containing 128.4 cu. yds. concrete; 8,230 lbs. steel; cost per ft., \$64.30; per cu. yd., \$21.05	\$2,700.00
Steel I-beam bridges: No. built, 1; Total length, 26 ft.; containing 50.0 cu. yds. concrete; 9,470 lbs. steel; cost per ft., \$57.75	1,500.00
Total No. built, 3; Total length, 68 ft.; Total estimated cost	4,200.00

LINCOLN COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 3; Total length, 75 ft.; containing 284.8 cu. yds. concrete; 17,020 lbs. steel; cost per ft., \$48.75; per cu. yds., \$12.85	\$3, 656.00
Steel I-beam bridges: No. built, 2; Total length, 54 ft.; containing 164.1 cu. yds. concrete; 20,880 lbs. steel; cost per ft., \$48.15	2, 600.00
Steel plate girder bridges: No. built, 1; Total length, 40 ft.; containing 127.7 cu. yds. concrete; 17,640 lbs. steel; cost per ft., \$50.00	1, 998.00
Total No. built, 6; Total length, 169 ft.; Total estimated cost	8, 254.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 10; Total length, 170 ft.; containing 668.9 cu. yds. concrete; 36,290 lbs. steel; cost per ft., \$68.25; per cu. yds., \$17.35	
Total No. built, 10; Total length, 170 ft.; Total estimated cost	\$11, 600.00

MANITOWOC COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 17; Total length, 224 ft.; containing 979.9 cu. yds. concrete; 47,620 lbs. steel; cost per ft., \$53.80; per cu. yd., \$12.30	\$12, 050.00
Steel I-beam bridges: No. built, 1; Total length, 28 ft.; containing 200.0 cu. yds. concrete; 25,890 lbs. steel; cost per ft., \$100.00	2, 800.00
Steel plate girder bridges: No. built, 1; Total length, 50 ft.; containing 87.0 cu. yds. concrete; 21,980 lbs. steel cost per ft., \$38.00	1, 900.00
Total No. built, 19; Total length, 302 ft.; Total estimated cost	16, 750.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 17; Total length, 332 ft.; containing 1,295.0 cu. yds. concrete; 78,390 lbs. steel; cost per ft., \$75.35; per cu. yd., \$19.30	
Total No. built, 17; Total length, 332 ft.; Total estimated cost	\$25, 000.00

MARATHON COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 20 ft.; containing 68.2 cu. yds. concrete; 3,760 lbs. steel; cost per ft., \$42.00; per cu. yd., \$12.30	\$840.00
Steel I- beam bridges: No. built, 3; Total length, 72 ft.; containing 127.0 cu. yds. concrete; 25,200 lbs. steel; cost per ft., \$35.55	2,560.00
Total No. built, 4; Total length, 92 ft.; Total estimated cost	3,400.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 20 ft.; containing 138.5 cu. yds. concrete; 5,890 lbs. steel; cost per ft., \$90.00; per cu. yd., \$13.00	\$1,800.00
Steel truss bridges: No. built, 1; Total length, 244 ft.; containing 536 cu. yds. concrete; 175,000 lbs. steel; cost per ft., \$70.30	17,150.00
Total No. built, 2; Total length, 264 ft.; Total estimated cost	18,950.00

MARINETTE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel truss bridges: No. built, 1; Total length, 45 ft.; containing 200.0 cu. yds. concrete; 7,830 lbs. steel; cost per ft., \$62.20	
Total No. built, 1; Total length, 45 ft.; Total estimated cost	\$2,800.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete arch bridges: No. built, 1; Total length, 50 ft.; containing 200.0 cu. yds. concrete; 9,840 lbs. steel; cost per ft., \$70.00; cu. yd., \$17.50	
Total No. built, 1; Total length, 50 ft.; Total estimated cost	\$3,500.00

MARQUETTE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No built, 1; Total length, 20 ft.; containing 44.0 cu. yds. concrete; 5,830 lbs. steel; cost per ft., \$40.00	
Total No. built, 1; Total length, 20 ft.; Total estimated cost	\$800.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 24 ft.; containing 73.5 cu. yds. concrete; 4,680 lbs. steel; cost per ft., \$75.10; per cu. yd., \$24.50
Total No. built, 2; Total length, 24 ft.; Total estimated cost \$1,800.00

MILWAUKEE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 22 ft.; containing 96.0 cu. yds. concrete; 5,490 lbs. steel; cost per ft., \$56.80; per cu. yd., \$13.00
Total No. built, 1; Total length 22 ft.; Total estimated cost \$1,250.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 4; Total length, 246 ft.; containing 1,076.8 cu. yds. concrete; 64,180 lbs. steel; cost per ft., \$66.70; per cu. yd., \$15.25
Total No. built, 4; Total length, 246 ft.; Total estimated cost \$16,400.00

MONROE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 16; Total length, 225 ft.; containing 1,111.7 cu. yds. concrete; 42,990 lbs. steel; cost per ft., \$59.70; per cu. yd., \$12.10 \$13,450.00
Steel I-beam bridges: No. built, 5; Total length, 78 ft.; containing 429.5 cu. yds. concrete; 26,080 lbs. steel cost per ft., \$81.40 6,350.00
Total No. built, 21; Total length, 303 ft.; Total estimated cost 19,800.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 16; Total length, 349 ft.; containing 1,569.0 cu. yds. concrete; 81,320 lbs. steel; cost per ft., \$79.00; per cu. yd., \$17.55
Total No. built, 16; Total length, 349 ft.; Total estimated cost \$27,572.00

OCONTO COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 11; Total length, 255 ft.; containing 1,031.6 cu. yds. crete; 68,420 lbs. steel; cost per ft., \$50.10; per cu. yd., \$12.60	\$13,000.00
Steel plate girder bridges: No. built, 1; Total length, 60 ft.; containing 104.7 cu. yd. concrete; 30,680 lbs. steel; cost per ft., \$48.30	2,900.00
Total No. built, 12; Total length, 315 ft.; Total estimated cost	15,900.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 10; Total length, 126 ft.; containing 554.4 cu. yds. concrete; 28,120 lbs. steel; cost per ft., \$78.20; per cu. yd., \$17.75	
Total No. built, 10; Total length, 126 ft.; Total estimated cost	\$9,850.00

ONEIDA COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 2; Total length, 22 ft.; containing 62.4 cu. yds. concrete; 7,200 lbs. steel; cost per ft., \$66.70	
Total No. built, 2; Total length, 22 ft.; Total estimated cost	\$1,468.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 59 ft.; containing 220.3 cu. yds. concrete; 15,920 lbs. steel; cost per ft., \$64.10; per cu. yd., \$17.15	\$3,780.00
Steel truss bridges: No. built, 1; Total length, 100 ft.; containing 212.9 cu. yds. concrete; 61,090 lbs. steel; cost per ft., \$58.70	5,870.00
Total No. built, 3; Total length, 159 ft.; Total estimated cost	9,650.00

OUTAGAMIE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 15; Total length, 442 ft.; containing 1,584.6 cu. yds. concrete; 109,880 lbs. steel; cost per ft., \$51.20; per cu. yd., \$14.25	
Total No. built, 15; Total length, 442 ft.; Total estimated cost	\$22,620.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 6; Total length, 120 ft.; containing 478.0 cu. yds. concrete; 31,290 lbs. steel; cost per ft., \$78.75; per cu. yd., \$19.75
 Total No. built, 6; Total length, 120 ft.; Total estimated cost \$9,450.00

OZAUKEE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 30 ft.; containing 111.5 cu. yds. concrete; 5,730 lbs. steel; cost per ft., \$48.35; per cu. yd., \$13.00 \$1,450.00
 Steel I-beam bridges: No. built, 3; Total length, 64 ft.; containing 204.2 cu. yds. concrete; 22,360 lbs. steel; cost per ft., \$46.90 3,000.00
 Total No. built, 5; Total length, 94 ft.; Total estimated cost 4,450.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 106 ft.; containing 362.2 cu. yds. concrete; 26,760 lbs. steel; cost per ft., \$74.55; per cu. yd., \$21.80
 Total No. built 2; Total length, 106 ft.; Total estimated cost \$7,900.00

PEPIN COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel truss bridges: No. built, 2; Total length, 100 ft.; containing 289.8 cu. yds. concrete; 47,180 lbs. steel; cost per ft., \$50.00
 Total No. built, 2; Total length, 100 ft.; Total estimated cost \$5,000.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 5; Total length, 110 ft.; containing 200.0 cu. yds. concrete; 10,580 lbs. steel; cost per ft., \$48.65; per cu. yd., \$26.75
 Total No. built, 5; Total length, 110 ft.; Total estimated cost \$5,350.00

PIERCE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 8; Total length, 60 ft.; containing 296.5 cu. yds. concrete, 15,040 lbs. steel; cost per ft., \$65.90; per cu. yd., \$13.30	\$3,950.00
Steel I-beam bridges: No. built, 25; Total length, 512 ft.; containing 1,743.6 cu. yds. concrete; 211,270 lbs. steel; cost per ft., \$50.40	25,800.00
Steel truss bridges: No. built, 1; Total length, 40 ft.; containing 71.8 cu. yds. concrete; 16,800 lbs. steel; cost per ft., \$42.50	1,700.00
Total No. built, 34; Total length, 612 ft.; Total estimated cost	31,450.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 22; Total length, 342 ft.; containing 1,493.0 cu. yds. concrete; 80,510 lbs. steel; cost per ft., \$80.15; per cu. yd., \$18.35	\$27,400.00
Steel I-beam bridges: No. built, 3; Total length, 84 ft.; containing 271.4 cu. yds. concrete; 33,380 lbs. steel; cost per ft., \$52.40	4,400.00
Steel truss bridges: No. built, 1; Total length, 45 ft.; containing 100.1 cu. yds. concrete; 19,920 lbs. steel; cost per ft., \$55.60	2,500.00
Total No. built, 26; Total length, 471 ft.; Total estimated cost	34,300.00

POLK COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 20 ft.; containing 88.6 cu. yds. concrete; 4,110 lbs. steel; cost per ft., \$55.00; per cu. yd., \$12.40	\$1,100.00
Steel I-beam bridges: No. built, 1; Total length, 16 ft.; containing 50.4 cu. yds. concrete; 4,510 lbs. steel; cost per ft., \$53.10	850.00
Total No. built, 3; Total length, 36 ft.; Total estimated cost	1,950.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 28 ft.; containing 115.8 cu. yds. concrete; 5,740 lbs. steel; cost per ft., \$78.60; per cu. yd., \$19.00	
Total No. built, 2; Total length, 28 ft.; Total estimated cost	\$2,200.00

PORTAGE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 4; Total length, 86 ft.; containing 172.2 cu. yds. concrete; 25,980 lbs. steel; cost per ft., \$37.80	
Total No. built, 4; Total length, 86 ft.; Total estimated cost	\$3,250.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 3; Total length, 72 ft.; containing 161.1 cu. yds. concrete; 20,650 lbs. steel; cost per ft., \$52.75	
Total No. built, 3; Total length, 72 ft.; Total estimated cost	\$3,800.00

PRICE COUNTY

NO 1916 COUNTY AID BRIDGE CONSTRUCTION

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built: 1; Total length, 10 ft.; containing 42.2 cu. yds. con- crete; 1,810 lbs. steel; cost per ft., \$75.00; per cu. yd., \$17.75	
Total No. built, 1; Total length, 10 ft.; Total estimated cost	\$750.00

RACINE COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built: 1; Total length, 6 ft.; containing 38.6 cu. yds. con- crete; 1,660 lbs. steel; cost per ft., \$91.70; per cu. yd., \$14.25	\$550.00
Steel I-beam bridges: No. built, 1; Total length, 10 ft.; containing 3.2 cu. yds. concrete; 2,290 lbs. steel; cost per ft., \$10.00	100.00
Total No. built, 2; Total length, 16 ft.; Total estimated cost	650.00

NO 1917 COUNTY AID BRIDGE CONSTRUCTION

RICHLAND COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel truss bridges: No. built, 1; Total length, 50 ft.; containing 185.1 cu. yds. concrete; 23,200 lbs. steel; cost per ft., \$70.90	\$3,545.00
Steel plate girder bridges: No. built, 2; Total length, 125 ft.; containing 624.3 cu. yds. concrete; 94,410 lbs. steel; cost per ft., \$76.70	9,592.00
Total No. built 3; Total length, 175 ft.; Total estimated cost	13,137.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built: 6; Total length, 44 ft.; containing 238.7 cu. yds. concrete; 10,370 lbs. steel; cost per ft., \$116.00; per cu. yd., \$21.40	\$5,120.00
Steel truss bridges: No. built, 1; Total length, 100 ft.; containing 217.1 cu. yds. concrete; 72,810 lbs. steel; cost per ft., \$68.00	6,800.00
Total No. built, 7; Total length, 144 ft.; Total estimated cost	11,920.00

ROCK COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built: 6; Total length, 74 ft.; containing 293.6 cu. yds. concrete; 13,740 lbs. steel; cost per ft., \$57.50; per cu. yd., \$14.50	\$4,250.00
Steel truss bridges: No. built, 1; Total length, 90 ft.; containing 208.1 cu. yds. concrete; 54,080 lbs. steel; cost per ft., \$66.30	5,968.00
Total No. built, 7; Total length, 164 ft.; Total estimated cost	10,218.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 6; Total length, 86 ft.; containing 378.4 cu. yds. concrete; 21,410 lbs. steel; cost per ft., \$78.50; per cu. yd., \$17.80	
Total No. built, 6; Total length, 86 ft.; Total estimated cost	\$6,750.00

RUSK COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 7; Total length, 138 ft.; containing 347.8 cu. yds. concrete; 50,360 lbs. steel; cost per ft., \$36.10	\$4, 978.00
Steel truss bridges: No. built, 1; Total length, 40 ft.; containing 80.4 cu. yds. concrete; 16,930 lbs. steel; cost per ft., \$34.60	1, 385.00
Total No. built, 8; Total length, 178 ft.; Total estimated cost	6, 363.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 6; Total length, 132 ft.; containing 583.6 cu. yds. concrete; 36,420 lbs. steel; cost per ft., \$59.80; per cu. yd., \$13.50	\$7, 895.00
Steel truss bridges: No. built, 1; Total length, 50 ft.; containing 144.5 cu. yds. concrete; 23,190 lbs. steel; cost per ft., \$80.00	4, 000.00
Total No. built, 7; Total length, 182 ft.; Total estimated cost	11, 895.00

ST. CROIX COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 28 ft.; containing 119.5 cu. yds. concrete; 5,730 lbs. steel; cost per ft., \$53.60; per cu. yd., \$12.55	\$1, 500.00
Steel I-beam bridges: No. built, 9; Total length, 222 ft.; containing 520.6 cu. yds. concrete; 94,670 lbs. steel; cost per ft., \$34.50	7, 659.00
Steel truss bridges: No. built, 3; Total length, 192 ft.; containing 445.2 cu. yds. concrete; 86,510 lbs. steel; cost per ft., \$37.75	7, 247.00
Total No. built, 14; Total length, 442 ft.; Total estimated cost	16, 460.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 8; Total length, 90 ft.; containing 389.5 cu. yds. concrete; 18,250 lbs. steel; cost per ft., \$77.80; per cu. yd., \$17.95	
Total No. built, 8; Total length, 90 ft.; Total estimated cost	\$7, 000.00

SAUK COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 4; Total length, 24 ft.; containing 115.3 cu. yds. concrete; 5,080 lbs. steel; cost per ft., \$63.30; per cu. yd., \$13.20	\$1,520.00
Reinforced concrete arch bridges: No. built, 1; Total length, 24 ft.; containing 190.0 cu. yds. concrete, 5,380 lbs. steel; cost per ft., \$112.50; cu. yd., \$14.20	2,700.00
Steel I-beam bridges: No. built 2; Total length, 54 ft.; containing 77.0 cu. yds. concrete; 19,650 lbs. steel; cost per ft., \$32.40	1,750.00
Total No. built, 7; Total length, 102 ft.; Total estimated cost	5,970.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 4; Total length, 55 ft.; containing 242.7 cu. yds. concrete; 12,400 lbs. steel; cost per ft., \$83.60; per cu. yd., \$18.95	
Total No. built, 4; Total length, 55 ft.; Total estimated cost	\$4,600.00

SAWYER COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 3; Total length, 82 ft.; containing 194.7 cu. yds. concrete; 32,150 lbs. steel; cost per ft., \$39.05	\$3,200.00
Steel truss bridges: No. built, 1 Total length, 101 ft., containing 140.2 cu. yds. concrete; 45,900 lbs. steel; cost per ft., \$35.65	3,600.00
Total No. built, 4; Total length, 183 ft.; Total estimated cost	6,800.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 26 ft.; containing 114.3 cu. yds. concrete; 5,610 lbs. steel; cost per ft., \$88.50; per cu. yd., \$20.10	
Total No. built 2; Total length, 26 ft.; Total estimated cost	\$2,300.00

SHAWANO COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 13; Total length 182 ft.; containing 712.3 cu. yds. concrete; 37,050 lbs. steel; cost per ft., \$49.75; per cu. yd., \$12.70	\$9,050.00
Steel truss bridges: No. built, 3; Total length 195 ft.; containing 351.3 cu. yds. concrete; 103,350 lbs. steel; cost per ft., \$42.05	8,200.00
Total No. built, 16; Total length, 377 ft.; Total estimated cost	17,250.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 9; Total length, 118 ft.; containing 568.2 cu. yds. concrete; 23,300 lbs. steel; cost per ft., \$81.80; per cu. yd., \$16.95	
Total No. built, 9; Total length, 118 ft.; Total estimated cost	\$9,650.00

SHEBOYGAN COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 4; Total length, 80 ft.; containing 340.7 cu. yds. concrete; 22,160 lbs. steel; cost per ft., \$47.60; per cu. yd. \$11.20	\$3,810.00
Steel I-beam bridges: No. built, 1; Total length, 12 ft.; containing 40.6 cu. yds. concrete; 3,170 lbs. steel; cost per ft., \$37.50	450.00
Steel truss bridges: No. built, 2; Total length, 220 ft.; containing 180.6 cu. yds. concrete; 117,870 lbs. steel; cost per ft., \$33.65	7,400.00
Total No. built 7; Total length, 312 ft.; Total estimated cost	11,660.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 4; Total length, 72 ft.; containing 450.7 cu. yds. concrete; 19,410 lbs. steel; cost per ft., \$109.00; per cu. yd. \$17.40	\$7,850.00
Steel truss bridges: No. built, 1; Total length, 85 ft.; containing 159.2 cu. yds. concrete; 55,910 lbs. steel; cost per ft. \$84.70	7,200.00
Total No. built, 5; Total length, 157 ft.; Total estimated cost	15,050.00

TAYLOR COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 1; Total length, 22 ft.;
containing 31.9 cu. yds. concrete; 8,680 lbs. steel;
cost per ft., \$22.75
Total No. built, 1; Total length, 22 ft.; Total estimated
cost \$500.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built,
2; Total length, 34 ft.; containing 119.6 cu. yds. con-
crete; 6,170 lbs. steel; cost per ft., \$67.70; per cu.
yd., \$19.20
Total No. built 2; Total length, 34 ft.; Total estimated
cost \$2,300.00

TREMPEALEAU COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges, No. built,
3; Total length, 36 ft.; containing 160.7 cu. yds. con-
crete; 7,950 lbs. steel; cost per ft., \$65.30; per cu.
yd., \$14.60 \$2,350.00
Steel I-beam bridges; No. built, 13; Total length, 274 ft.;
containing 705.8 cu. yds. concrete; 96,370 lbs. steel;
cost per ft., \$45.10 12,350.00
Total No. built, 16; Total length 310 ft.; Total estimated
cost 14,700.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built,
1; Total length, 20 ft.; containing 68.7; cu. yds. con-
crete; 3,760 lbs. steel; cost per ft., \$82.50; per cu.
yd., \$24.05 \$1,650.00
Steel truss bridges: No. built, 2; Total length, 160 ft.;
containing 277.2 cu. yds. concrete; 102,630 lbs. steel;
cost per ft., \$64.50 10,320.00
Total No. built, 3; Total length, 180 ft.; Total estimated
cost 11,970.00

VERNON COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel I-beam bridges: No. built, 1; Total length, 20 ft.; containing 115.0 cu. yds. concrete; 6,150 lbs. steel; cost per ft., \$70.00	\$1,400.00
Steel truss bridges: No. built, 1; Total length 90 ft.; containing 189.7 cu. yds. concrete; 54,040 lbs. steel; cost per ft., \$56.70	5,100.00
Total No. built, 2; Total length, 110 ft.; Total estimated cost	6,500.00

NO 1917 COUNTY AID BRIDGE CONSTRUCTION

VILAS COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Steel truss bridges: No. built, 1; Total length, 65 ft.; containing 117.4 cu. yds. concrete; 33,190 lbs. steel; cost per ft., \$43.85	
Total No. built, 1; Total length, 65 ft.; Total estimated cost	\$2,850.00

NO 1917 COUNTY AID BRIDGE CONSTRUCTION

WALWORTH COUNTY

NO 1916 COUNTY AID BRIDGE CONSTRUCTION

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 25 ft.; containing 101.3 cu. yds. concrete, 6,570 lbs. steel; cost per ft., \$70.00; per cu. yd., \$17.30	\$1,750.00
Reinforced concrete arch bridges: No. built, 1; Total length, 40 ft.; containing 368.0 cu. yds., concrete; 11,840 lbs. steel; cost per ft., \$228.00; cu. yd., \$24.75	9,120.00
Total No. built, 2; Total length, 65 ft.; Total estimated cost	10,870.00

WASHBURN COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 8 ft.; containing 62.6 cu. yds. concrete; 1,690 lbs. steel; cost per ft., \$81.30; per cu. yd., \$10.40

Total No. built, 1; Total length, 8 ft.; Total estimated cost \$650.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Steel truss bridges: No. built, 1; Total length, 165 ft.; containing 181.3 cu. yds. concrete; 70,160 lbs. steel; cost per ft., \$41.15

Total No. built, 1; Total length, 165 ft.; Total estimated cost \$6,800.00

WASHINGTON COUNTY

NO 1916 COUNTY AID BRIDGE CONSTRUCTION

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 92 ft.; containing 285.0 cu. yds. concrete, 23,020 lbs. steel; cost per ft., \$54.35; per cu. yd., \$17.55

Total No. built, 1; Total length, 92 ft.; Total estimated cost \$5,000.00

WAUKESHA COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 6; Total length, 80 ft.; containing 355.3 cu. yds. concrete; 17,550 lbs. steel; cost per ft., \$56.20; per cu. yd., \$12.65

Total No. built, 6; Total length, 80 ft.; Total estimated cost \$4,500.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 5; Total length, 56 ft.; containing 365.6 cu. yds. concrete; 20,190 lbs. steel; cost per ft., \$118.65; per cu. yd., \$18.20

Total No. built, 5; Total length, 56 ft.; Total estimated cost \$6,650.00

WAUPACA COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 5; Total length, 56 ft.; containing 256.8 cu. yds. concrete; 9,870 lbs. steel; cost per ft., \$60.70; per cu. yd., \$13.25	\$3,400.00
Steel I-beam bridges: No. built, 3; Total length, 50 ft.; containing 138.2 cu. yds. concrete; 12,970 lbs. steel; cost per ft., \$40.00	2,000.00
Total No. built, 8; Total length, 106 ft.; Total estimated cost	5,400.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 2; Total length, 64 ft.; containing 268.7 cu. yds. concrete; 21,720 lbs. steel; cost per ft., \$92.20; per cu. yd., \$22.00	
Total No. built, 2; Total length, 64 ft.; Total estimated cost	\$5,900.00

WAUSHARA COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 3; Total length, 38 ft.; containing 149.8 cu. yds. concrete; 7,330 lbs. steel; cost per ft., \$42.05; per cu. yd., \$11.65	\$1,598.00
Steel I-beam bridges: No. built, 2; Total length, 44 ft.; containing 105.4 cu. yds. concrete; 13,530 lbs. steel; cost per ft., \$33.20	1,460.00
Total No. built, 5; Total length, 82 ft.; Total estimated cost	3,058.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 6; Total length, 62 ft.; containing 302.5 cu. yds. concrete; 14,380 lbs. steel; cost per ft., \$74.35; per cu. yd., \$15.20	
Total No. built, 6; Total length, 62 ft.; Total estimated cost	\$4,605.00

WINNEBAGO COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 3; Total length, 57 ft.; containing 232.7 cu. yds. concrete; 12,260 lbs. steel; cost per ft., \$49.30; per cu. yd., \$12.10	
Total No. built, 3; Total length, 57 ft.; Total estimated cost	\$2,810.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 3; Total length, 96 ft.; containing 360.0 cu. yds. concrete; 16,070 lbs. steel; cost per ft., \$78.65; per cu. yd., \$21.00	
Total No. built, 3; Total length 96 ft.; Total estimated cost	\$7,550.00

WOOD COUNTY

1916 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 1; Total length, 10 ft.; containing 68.8 cu. yds. concrete; 2,720 lbs. steel; cost per ft., \$90.00; per cu. yd., \$13.05	\$900.00
Steel I-beam bridges: No. built, 1; Total length, 224 ft.; containing 153.0 cu. yds. concrete; 16,040 lbs. steel; cost per ft., \$10.70	2,400.00
Total No. built 2; Total length, 234 ft.; Total estimated cost	3,300.00

1917 COUNTY AID BRIDGE CONSTRUCTION

Reinforced concrete slab and girder bridges: No. built, 4; Total length, 46 ft.; containing 168.8 cu. yds. concrete; 8,500 lbs. steel; cost per ft., \$67.40; per cu. yd., \$18.40	\$3,100.00
Steel truss bridges: No. built, 1; Total length, 60 ft.; containing 141.5 cu. yds. concrete; 29,800 lbs. steel; cost per ft., \$65.00	3,900.00
Total No. built, 5; Total length, 106 ft.; Total estimated cost	7,000.00

TABLE I.

Showing funds available for the maintenance of the Wisconsin Highway Commission and classified expenditures for the fiscal years 1916-17 and 1917-18. These figures agree with the budget figures for each year.

The system of accounting in force since the creation of the commission was changed June 30, 1916. Consequently the classified expenditures of the last two years cannot be combined with the expenditures between July 1, 1911, and June 30, 1916. The figures for this period are found on page 292 of the previous biennial report.

ADMINISTRATION STATE AID			ADMINISTRATION FEDERAL AID	
Item	Fiscal Years		Item	Fiscal Years
	1916-1917	1917-1918		1917-1918
<i>Funds Available</i>			<i>Funds Available</i>	
Balances: Cash.....	\$2,506.12	\$7,206.04	Appropriation	\$80,000.00
Preceding years eng'r. services...	3,954.04	5,066.85	<i>Classified Expenditures</i>	
Appropriation.....	65,000.00	65,000.00	Administration ¹	\$21,276.26
Credits (actual and prospective).....	38,644.04	24,294.25	General inspection.....	2,619.47
Total available.....	\$110,104.20	\$101,567.14	Road department.....	*58,628.22
<i>Classified Expenditures</i>			Supervision.....	2,609.79
Administration.....	*\$20,846.67	*\$17,425.64	Surveys.....	15,188.55
General inspection.....	4,230.39	4,016.10	Plans.....	16,785.39
Road department.....	*65,082.56	*49,722.52	Inspection of construction	726.87
Supervision.....	4,248.32	9,569.97	Condition surveys.....	9,694.32
Surveys.....	13,765.92	8,163.13	Federal maintenance.....	8,673.30
Plans.....	34,096.26	20,962.45	Bridge department.....	*677.79
Inspection of construction.	12,922.06	11,026.97	Supervision.....	137.01
Bridge department.....	*12,347.74	*10,454.60	Surveys.....	63.15
Supervision.....	244.87	898.38	Plans.....	454.65
Surveys.....	2,546.62	1,371.79	Inspection of construction	22.98
Plans.....	6,931.68	6,423.71	Capital expenditures.....	1,356.74
Inspection of construction.	2,624.57	1,760.72	1916-1917 fiscal years bills....	\$64.77
Experimental roads.....		1,066.85	1917-1918 fiscal years bills	18.10
Cement commission.....		37.26		
Capital expenditures.....	440.80	1,350.79		
1916-1917 fiscal year bills.....		3.72		
Total expenditures.....	\$102,898.16	\$84,077.48	Total expenditures.....	\$79,941.35
Less amounts chargeable to counties for road plans....	34,437.65	28,500.64	Balance June 30, 1918.....	\$58.65
Net expenditures.....	\$68,460.51	\$55,576.84		
Balance June 30th.....	\$7,206.04	\$17,489.66		

*Total expenditures of department.

¹ Includes cost of layout of State Trunk Highway System, except surveys.

TABLE II.

Showing the net expenditures for State Aid Supervision by the Wisconsin Highway Commission for the period from June 30, 1911, to December 31, 1916, inclusive, covered by the previous report, and the calendar years 1916 and 1917, covered by this report, the total cost of all construction surveyed, planned and supervised by the Commission during the same periods, and the ratio of supervision to construction costs. Note the low and decreasing cost of supervision.

ITEM	CALENDAR YEARS			Grand Total
	Total for 4½ years (June 30, 1911, to Dec. 31, 1915)	1916	1917	
<i>Annual Expenditures</i>				
Expenditures for supervision chargeable to the state.....	\$309,384.11	\$69,088.75	\$62,195.46	\$440,668.32
<i>Work Supervised</i>				
State aid road construction.....	11,000,798.53	3,490,010.49	3,561,139.39	18,051,948.41
State aid bridge construction.....	896,220.78	461,715.54	420,070.64	1,778,006.96
Special state aid bridges.....			44,673.18	44,673.18
Total state aid construction....	\$11,897,019.31	\$3,951,726.03	\$4,025,883.21	\$19,874,628.55
County and town road construction....	289,600.30	42,600.00	400,000.00	732,200.00
County aid bridge construction....	1,316,013.00	479,228.00	605,870.00	2,401,111.00
Total construction other than state aid.....	\$1,605,613.00	\$521,828.00	\$1,005,870.00	\$3,133,311.00
Grand total all construction...	\$13,812,016.42	\$4,542,642.78	\$5,098,948.67	\$23,448,607.78
Percentage of expenditures for supervision of amount expended for construction.....	2.239%	1.525%	1.220%	1.880%

TABLE III.

COUNTY HIGHWAY COMMISSIONERS.

County Highway Commissioners in office since 1911, with calendar years served. The last name in each series is the present incumbent with the date of his incumbency.

County	Name and address of commissioners
Adams	1912—No work; 1913—J. A. McGregor, Hancock.
Ashland	1912-1913—Geo. E. Foster, Mellen; 1914—W. E. Dillon, Highbridge.
Barron	1912—Robert Reese, Cameron; 1913-1917—Simon S. Berg, Rice Lake; 1917—Ed. Gleason, Cumberland.
Bayfield	1912—Eben Olson, Port Wing; 1913-1917—John Sundell, Ashland; 1918—J. R. Kunzelman, Washburn.
Brown	1912-1913—Henry Van den Heuvel, Green Bay; 1913—Geo. J. Cormler, Green Bay.
Buffalo	1912—Julius Reinhart, Nelson.
Burnett	1912-1913—No work; 1914-1917—Hugh Jeffries, Danbury; 1917—A. T. Sjoblom, Grantsburg; 1918—Geo. E. Miller, Gaslyn.
Calumet	1912—No work; 1913—Wm. Hoenig, Chilton.
Chippewa	1912-1913—G. W. White, Chippewa Falls; 1913—P. O. Lokrantz, Chippewa Falls.
Clark	1912—W. O. Thoma, Neillsville.
Columbia	1912-1915—Clinton Quinn, Pardeeville; 1916—J. T. Henton, Portage.
Crawford	1912—Peter J. Sime, Prairie du Chien; 1913—J. N. Campbell, Bell Center.
Dane	1912-1913—O. S. Shampnor, Madison; 1913-1916—W. H. Sommers, Madison; 1917-1918—F. J. Smith, Madison; 1918—F. M. Lipke, Madison.
Dodge	1912-1913—J. H. Carroll, Juneau; 1914—E. T. Klug, Juneau.
Door	1912—Frank Wellever, Sturgeon Bay; 1913-1914—H. A. Wagner, Sturgeon Bay; 1915—Aug. Moeller, Sturgeon Bay; 1916—J. M. Laurie, Sturgeon Bay.
Douglas	1912—O. J. Morriset, Superior (East End).
Dunn	1912—W. A. Harding, Menomone; 1913—A. Wagner, Downing; 1913-1915—Wm. Raven, Colfax; 1916—Frank Stewart, Menomone.
Eau Claire	1912—Wm. Maher, Augusta; 1913—Thos. Thompson, Augusta; 1913—Wm. J. Wolf, Eau Claire.
Florence	1912—Ray Bowen, Commonwealth; 1913—Rowland Watts, Florence; 1914—Special; 1915-1918—J. F. Barry, Florence; 1918—O. F. Soderberg, Florence.
Fond du Lac	1912-1917—M. Costello, Fond du Lac; 1918—Wm. Kohl, Ripon; 1918—Geo. E. Treleven, Fond du Lac.
Forest	1912—J. O. Sherman, Orandon; 1913-1914—Barney McGinley, Orandon; 1915—Wm. M. Sherlock, Orandon.
Grant	1912-1913—Adolph Wepking, Lancaster; 1914—Henry Mink, Lancaster.
Green	1912-1913—M. M. Hulbert, Monroe; 1914—E. L. Edwards, Monroe.
Green Lake	1912—Gustav Schmidt, Berlin; 1913—W. L. Friday, Green Lake; 1913—T. J. Paull, Green Lake.
Iowa	1912-1913—J. D. Bennett, Mineral Point; 1914—J. W. Pearcey, Dodgeville.
Iron	1912—No work; 1913—William Weber, Saxon.
Jackson	1912-1917—A. D. Polleys, Melrose; 1918—Wm. Tibbitts, Black River Falls.
Jefferson	1912—A. R. Hoard, For Atkinson; 1912—R. D. Royce, Fort Atkinson.
Juneau	1912—A. V. Robison, New Lisbon.
Kenosha	1912—J. G. Williams, Kenosha; 1913—M. McGeehan, Kenosha; 1914—John Herzog, Kenosha.
Kewaunee	1912—Moses Shaw, Algoma.
La Crosse	1912—John Hintgen, La Crosse.
Lafayette	1912—Geo. H. Priestley, Darlington.
Lafayette	1913-1916—T. W. Humble, Antigo; 1917—Carl Olson, Elcho.
Langlade	1912—Joseph Rell, Tomahawk; 1913—Ole C. Larson, Irma; 1914—H. H. Kuehling, Tomahawk.
Lincoln	1912—Frank Muth, Manitowoc; 1913—Wm. Schmook, Two Rivers; 1914—Frank Muth, Manitowoc.
Manitowoc	1912-1914—R. H. Brown, Unity; 1915-1917—E. D. Clapp, Wausau; 1917—J. H. Vogt, Wausau.
Marathon	1912—Andrew Eklund, Peshtigo.
Marquette	1912—Levi Jones, Endeavor.

TABLE III—Continued.

County	Name and address of commissioners.
Milwaukee	1912-1917—H. J. Kuelling, Milwaukee; 1917—F. W. Whitlow, Milwaukee.
Monroe	1912-1914—T. T. Teall, Sparta; 1915-1918—F. M. Johnson, Sparta; 1918—Robert Prescott, Sparta.
Oconto	1912-1915—James D. Vereaux, Oconto; 1916—Peter Peetz, Lena.
Oneida	1912—Special; 1913—Frank E. Parker, Rhineland.
Outagamie	1912—Special; 1918—Wm. Conlan, Shiocton; 1914—A. G. Bruswitz, Appleton.
Ozaukee	1912—No work; 1913-1917—Emil Schmechel, Thiensville; 1918—J. H. E. Mueller, Thiensville.
Pepin	1912-1913—John A. Gates, Pepin; 1914—Gale Goss, Durand.
Pierce	1912-1914—S. S. Crownhart, Ellsworth; 1915—O. F. Kenall, Ellsworth.
Polk	1912-1914—Robert Smith, Clam Falls; 1915-1918—J. R. McLean, Balsam Lake; 1918—Carl Nyberg, Balsam Lake.
Portage	1912-1914—Thos. E. Cauley, Stevens Point; 1914—H. J. Cowles, Stevens Point; 1914—Thos. E. Cauley, Stevens Point.
Price	1912—Special; 1913—C. G. Nelson, Ogema.
Racine	1912—Henry Hagerman, Waterford; 1913-1917—James Mutter, Racine; 1918—W. O. Thomas, Racine.
Richland	1912-1917—G. H. Mainwaring, Richland Center; 1918—M. O. Oarter, Richland Center.
Rock	1912—S. Jones, Janesville; 1913—C. E. Moore, Janesville.
Rusk	1912—F. M. Sergeant, Ladysmith; 1913—H. W. True, Ladysmith; 1914—Phil Koehler, Ladysmith.
St. Croix	1912—Joe Caffrey, Hammond.
Sauk	1912-1915—G. F. Post, Baraboo; 1916—J. H. Gunnison, Baraboo.
Sawyer	1912-1913—No work; 1914—E. J. Collett, Hayward.
Shawano	1912—Special; 1913—Louis Rollman; 1914-1918—O. C. Rollman, Shawano; 1918—W. F. Meyer, Shawano.
Sheboygan	1912-1915—G. W. Ubbelohde, Sheboygan Falls; 1916—G. C. Peterson, Sheboygan; 1916—J. B. Mersberger, Sheboygan; 1917—Chas. W. Fischer, Sheboygan; 1918—G. W. Ubbelohde, Sheboygan.
Taylor	1912-1916—H. O. Peterson, Medford; 1917—Ferd. Grahl, Medford.
Trempealeau	1912-1915—E. J. Matchett, Osseo; 1916—Emil Rotering, Arcadia.
Vernon	1912—Alex Bistow, Viroqua.
Vilas	1912—No work; 1913-1914—G. H. Jackson, Eagle River; 1915—J. T. Nemacheck, Eagle River.
Walworth	1912—H. J. Peters, Elkhorn.
Washburn	1912-1913—No work; 1914—Fred L. Irwin, Spooner.
Washington	1912-1913—Don Cameron, West Bend; 1914—Chas. Johnson, Kewaskum.
Waukesha	1912-1914—R. F. Sprague, Mukwonago; 1915—Chas. J. Hahn, Delafield.
Waupaca	1912—O. J. Knudson, Scandinavia.
Wautoma	1912—Henry Beighton, Wautoma; 1913—Fred Grimm, Wautoma.
Winnebago	1912—W. Noble, Omro; 1912—James Binning, Oshkosh.
Wood	1912—Louis Amundson, Grand Rapids.

Notes—Total number of Commissioners in office from 1912 to 1918, inclusive, was 146. This does not include changes back to a former commissioner, but is the total separate incumbents.

Number of Commissioners holding office continuously since the county first had a commissioner until the end of 1918 is 23.

TABLE IV.

ALLOTMENTS TO COUNTIES FROM STATE AID FUNDS.

Showing by counties, the amounts allotted from the State Aid Highway Fund for 1918 and 1919 construction; the total amounts previously allotted to the counties for the years 1912 to 1917, inclusive, and the grand total amounts allotted to the counties for the eight year period.

County	Total allotment for the years 1912, 1913, 1914, 1915, 1916, 1917	Allotment 1918	Allotment 1919	Grand total
Adams	\$13,826	\$2,303	\$2,291	\$18,420
Ashland	69,897	4,711	4,687	79,295
Barron	50,488	7,768	8,210	66,466
Bayfield	34,738	4,353	4,659	43,750
Brown	107,613	14,919	14,962	137,494
Buffalo	40,804	5,285	5,325	51,414
Burnett	13,703	2,263	2,316	18,282
Calumet	33,703	7,537	7,375	48,615
Chippewa	61,046	8,875	9,113	79,034
Clark	61,172	8,871	9,359	79,402
Columbia	102,198	12,245	11,992	126,435
Crawford	25,837	4,741	4,909	35,487
Dane	238,906	39,406	39,079	337,391
Dodge	133,346	21,589	21,484	176,969
Door	47,427	4,629	4,602	56,658
Douglas	97,942	13,752	13,870	125,564
Dunn	43,591	7,626	7,777	58,994
Eau Claire	37,829	7,817	7,935	53,581
Florence	18,170	1,350	997	20,517
Fond du Lac	94,753	18,075	17,618	130,446
Forest	41,876	3,083	3,059	48,018
Grant	123,863	16,845	16,501	157,209
Green	106,734	12,203	11,879	130,816
Green Lake	36,551	6,124	5,857	48,532
Iowa	57,222	11,424	11,471	80,117
Iron	37,232	2,897	2,887	43,016
Jackson	46,183	4,718	4,836	55,737
Jefferson	100,627	14,655	14,178	129,460
Juneau	46,957	4,567	4,624	56,148
Kenosha	88,427	13,440	13,337	115,204
Kewaunee	38,088	5,598	5,550	49,234
La Crosse	97,718	10,470	10,385	118,573
La Fayette	72,657	11,866	11,663	96,186
Langlade	35,432	4,895	4,890	45,207
Lincoln	42,808	4,755	4,717	52,280
Manitowoc	85,728	15,143	15,444	116,315
Marathon	80,557	14,847	15,162	110,566
Marquette	60,473	6,749	6,460	73,682
Marquette	25,255	3,033	3,000	31,288
Milwaukee	989,045	150,983	150,424	1,290,452
Monroe	71,467	8,044	8,140	87,651
Oconto	39,664	5,581	5,563	50,808
Oneida	36,024	3,235	3,267	42,526
Outagamie	78,811	15,055	15,187	109,053
Ozaukee	31,288	6,091	5,936	43,315
Pepin	11,463	2,125	2,152	15,740
Pierce	46,698	6,441	6,570	59,709
Polk	48,758	6,994	7,147	62,899
Portage	62,066	7,086	6,747	75,899
Price	33,892	3,712	3,787	41,391

TABLE IV—Continued.

County	Total allotment for the years 1912, 1913, 1914, 1915, 1916, 1917	Allotment 1918	Allotment 1919	Grand total
Racine	107,052	20,478	21,636	149,166
Richland	63,528	7,085	7,920	79,133
Rock	154,122	21,534	21,601	197,257
Rusk	37,639	3,485	3,515	44,639
St. Croix	46,605	8,532	8,701	63,838
Sauk	125,517	12,672	12,789	150,978
Sawyer	15,888	2,494	2,478	20,860
Shawano	52,546	7,782	7,774	68,102
Sheboygan	104,274	18,098	17,977	140,349
Taylor	28,985	3,767	3,832	36,584
Trempealeau	64,017	7,028	7,205	78,250
Vernon	61,911	8,861	8,973	79,745
Vilas	36,467	1,619	1,731	39,817
Walworth	86,728	14,394	14,019	115,111
Washburn	15,978	2,470	2,575	21,023
Washington	50,579	9,706	9,543	69,828
Waukesha	81,162	14,255	14,230	109,647
Waupaca	77,904	9,080	9,356	96,349
Waushara	43,381	4,764	4,556	52,701
Winnebago	80,719	17,230	16,975	114,924
Wood	69,081	8,315	8,274	85,620
Totals	\$5,433,586	\$785,000	\$785,000	\$7,003,586

TABLE V.

FUNDS PROVIDED FOR STATE HIGHWAY CONSTRUCTION

Showing, by counties, the amounts voted by local units (towns, villages and cities); the amounts appropriated by county board resolution to meet these votes, or to secure State Aid; the amounts allotted to the various counties from the State Highway Fund; the grand total amount available in each county for state highway construction; and the percentages of this total amount furnished by the various participating units of government. These figures are the totals for the seven construction years 1912 to 1918, inclusive.

These figures do not include any special funds which were provided by donations other than those donations upon which state and county aid were paid.

County	Local funds voted	% of total	County funds ap- propriated	% of total	State funds* distributed	% of total	Total fund
Adams	\$26,332.90	38.3	\$26,332.90	38.3	\$16,128.94	23.4	\$68,794.74
Ashland	53,513.54	21.7	136,517.55	80.6	74,608.80	27.7	269,639.89
Barron	68,462.35	34.1	74,288.41	37.1	57,758.72	28.8	200,507.48
Bayfield	41,558.96	23.9	92,937.12	53.6	39,090.71	22.5	173,586.79
Brown	154,294.75	34.7	165,494.75	37.2	124,531.35	28.1	444,320.85
Buffalo	84,561.00	39.4	84,561.00	39.4	45,289.56	21.2	214,411.56
Burnett	37,027.00	38.5	43,965.65	45.7	15,165.88	15.8	96,148.03
Calumet	36,250.00	28.3	50,655.20	39.5	41,364.44	32.2	128,269.64
Chippewa	25,300.00	11.1	133,550.00	58.4	69,921.55	30.5	228,771.55
Clark	69,351.61	24.2	147,287.00	51.4	70,042.28	24.4	286,680.87
Columbia	177,234.07	36.3	195,839.34	40.3	114,443.37	23.5	487,506.78
Crawford	39,099.23	34.8	42,645.16	38.0	30,577.66	27.2	112,312.05
Dane	283,539.31	30.0	363,298.15	38.4	296,311.94	31.6	945,169.40
Dodge	185,311.00	34.4	196,346.66	36.9	154,935.29	28.7	539,092.95
Door	101,735.83	39.8	101,735.83	39.8	52,056.07	30.4	255,527.73
Douglas	7,375.09	1.5	294,182.25	59.7	191,698.42	38.8	493,251.36
Dunn	67,763.00	35.7	71,062.84	37.4	51,217.85	26.9	190,063.19
Eau Claire	25,603.65	14.6	104,214.64	59.4	45,641.06	26.0	175,458.35
Florence	8,875.00	12.8	41,212.52	59.2	19,820.46	28.0	69,907.98
Fond du Lac	49,896.89	14.6	179,476.09	52.6	111,679.10	32.8	341,042.08
Forest	124,898.10	47.4	93,696.00	35.5	45,088.08	17.1	263,682.18
Grant	179,142.57	35.0	191,776.05	37.5	140,525.60	27.5	511,444.22
Green	217,852.30	38.9	222,352.30	39.8	118,964.72	21.8	559,069.32
Green Lake	40,893.00	30.6	49,838.59	37.4	42,675.17	32.0	133,406.76
Iowa	69,825.88	38.9	70,739.51	35.0	66,645.96	31.1	206,411.35
Iron	81,540.90	18.2	101,983.90	58.7	40,128.99	23.1	173,653.79
Jackson	97,196.00	39.6	97,196.00	39.7	50,651.80	30.7	245,043.80
Jefferson	157,439.99	36.6	157,439.99	36.6	115,541.94	26.8	430,421.92
Juneau	113,719.43	40.7	113,921.13	40.8	51,484.96	18.5	279,125.52
Kenosha	149,654.31	36.7	155,871.48	38.3	101,866.12	25.0	407,391.91
Kewaunee	108,300.00	41.6	108,300.00	41.6	43,694.22	16.8	260,294.22
La Crosse	183,438.50	34.6	239,790.79	45.1	108,187.67	30.3	531,436.96
La Fayette	113,046.60	36.4	113,046.60	36.4	84,523.56	27.2	310,616.76
Langlade	64,795.47	37.4	63,466.84	39.5	40,118.38	23.1	173,375.69
Lincoln	82,600.00	37.2	91,769.43	41.4	47,563.88	21.4	221,932.81
Manitowoc	117,423.00	33.7	127,227.40	36.5	108,371.12	29.8	348,021.52
Marathon	119,704.20	33.7	130,839.00	36.9	104,541.84	29.4	355,085.04
Marinette	91,408.33	36.2	94,083.92	37.2	67,222.23	26.6	252,714.53
Marquette	44,906.00	37.6	46,180.60	38.7	25,238.83	23.7	119,274.93
Milwaukee	42,245.00	1.3	2,084,000.00	68.2	1,140,027.33	35.5	3,216,272.33
Monroe	158,460.72	39.6	161,963.42	40.5	79,511.58	19.9	399,965.72
Oconto	66,125.65	37.2	66,125.65	37.2	45,451.61	25.6	177,702.93
Oneida	47,520.93	23.0	120,097.14	56.4	35,490.08	18.6	206,678.10
Outagamie	65,930.00	18.7	192,507.42	54.8	96,065.65	26.5	351,508.07
Ozaukee	48,140.00	34.9	52,440.00	38.0	37,378.15	27.1	137,958.15
Peplin	19,817.51	31.9	28,724.71	46.2	13,587.69	31.9	62,129.91
Pierce	82,835.45	36.9	88,665.00	39.5	53,138.95	23.6	224,639.40
Folk	43,590.54	19.4	125,729.82	55.9	55,550.95	24.7	234,871.81
Portage	81,914.27	30.9	112,325.53	42.4	70,701.19	26.7	264,940.99
Price	67,923.72	39.5	66,067.91	38.5	37,604.23	22.0	171,595.91

TABLE V—Continued.

County	Local funds voted	% of total	County funds appropriated	% of total	State funds distributed	% of total	Total fund
Bacine	137,263.60	32.1	162,342.53	38.0	127,530.80	29.9	427,136.43
Ricehand	46,945.33	18.2	140,408.98	54.3	71,028.96	27.5	258,373.21
Rock	227,943.74	35.9	232,964.05	36.7	173,656.19	27.4	634,563.98
Rusk	49,599.63	31.4	67,469.47	42.6	41,122.73	26.0	158,191.86
St. Croix	77,776.00	36.6	80,247.67	37.8	54,586.99	25.6	212,610.66
Sauk	261,247.79	39.5	261,965.83	39.6	188,072.90	20.9	661,186.52
Sawyer	5,366.87	10.0	29,773.53	55.6	18,332.27	34.4	53,522.67
Shawano	80,894.00	35.6	86,730.39	38.1	59,927.59	26.3	227,551.98
Sheboygan	165,315.66	36.5	165,315.66	36.5	122,370.93	27.0	453,002.25
Taylor	41,100.00	32.2	53,745.43	42.1	32,752.10	25.7	127,597.53
Trempealeau	149,673.29	39.8	154,740.51	41.2	71,044.46	19.0	375,358.26
Vernon	124,388.44	33.0	131,084.37	40.1	71,672.90	21.9	327,095.71
Vilas .....	.....	.....	105,500.00	73.5	33,066.33	26.5	148,566.33
Walworth	108,366.15	29.6	144,774.30	41.5	101,092.09	28.9	349,231.54
Washburn	23,416.62	24.3	54,465.49	56.6	18,447.73	19.1	96,329.84
Washington	62,793.00	34.5	62,793.00	34.5	56,392.98	31.0	181,978.98
Waukesha	95,848.75	23.4	146,723.36	43.4	95,417.28	28.2	337,989.39
Waupaca	84,514.30	27.1	140,327.60	45.0	86,992.55	27.9	311,834.45
Waushara	82,506.00	33.7	82,506.00	33.7	48,154.41	22.6	213,166.41
Winnebago	76,753.05	26.6	113,679.04	39.4	97,948.67	34.0	288,380.76
Wood	151,323.76	39.4	156,323.76	40.6	76,945.75	20.0	384,593.27
Totals	\$6,427,539.14	27.4	\$10,445,565.72	45.2	\$6,218,048.09	26.4	\$23,086,152.95

* The total amount of State Aid allotted up to and including 1918 (See Table 4) was \$7,003,536—\$785,000—\$6,218,536. The difference (\$5,538) between this amount and the amount \$6,218,048 shown above as being actually available is the result of the failure of some counties to claim the total amounts allotted them.

Forest	98.61	87.95	93.57	32.50	0.64	33.14	21.93	4.80	26.73	20.90	4.80	25.70	1.94	27.64	148.91	146.15	143.73
Grant	97.63	91.73	92.61	22.94	0.02	22.06	11.81	2.85	14.66	8.83	2.85	11.68	1.53	13.23	134.95	129.35	127.92
Green	130.80	124.75	23.88	27.07	.....	27.07	7.49	9.80	16.79	13.55	.....	13.55	.....	13.55	176.67	165.33	165.33
Green Lake	20.97	23.92	3.02	7.07	.....	7.07	2.23	7.56	9.79	4.80	.....	4.80	.....	4.30	44.75	35.29	35.29
Iowa	61.49	50.74	13.13	8.66	.....	8.66	0.99	9.56	10.56	7.27	.....	16.33	.....	16.33	33.17	76.22	76.22
Iron	72.42	70.35	11.67	8.86	2.53	11.44	7.84	.....	7.84	7.10	.....	7.10	1.97	9.07	91.93	86.31	91.93
Jackson	92.44	79.45	13.24	17.83	.....	17.83	1.97	3.12	6.09	7.45	.....	10.57	1.03	11.60	115.77	107.86	108.39
Jefferson	100.13	99.50	30.60	13.84	.....	13.84	9.07	1.97	11.04	11.15	.....	11.15	0.18	11.33	131.77	129.38	129.37
Juneau	74.31	68.28	20.09	13.81	4.21	18.01	4.39	11.81	16.30	9.13	.....	9.13	1.22	10.35	110.60	91.16	96.59
Kenosha	63.92	47.88	25.79	25.79	.....	25.79	4.36	1.97	6.33	4.36	.....	6.33	.....	6.33	86.04	80.00	80.00
Kewaunee	29.50	27.06	4.93	5.88	0.10	5.93	7.43	3.56	11.04	7.04	.....	8.56	.....	8.56	45.62	42.10	42.20
La Crosse	68.48	63.02	27.15	23.91	0.51	23.42	9.19	8.73	17.92	15.13	.....	23.62	0.25	23.57	113.56	109.55	110.31
La Fayette	85.37	74.46	22.33	24.20	.....	24.20	3.54	11.97	15.51	3.53	.....	3.55	0.59	4.44	123.21	102.51	103.10
Langlade	65.16	57.62	23.90	13.60	5.19	23.79	19.11	6.76	25.87	30.06	.....	36.27	0.09	36.36	119.33	112.49	117.77
Lincoln	111.87	104.91	12.41	14.55	0.05	14.60	15.17	5.62	20.79	13.15	.....	13.77	.....	13.77	145.07	133.23	133.23
Manitowoc	59.03	53.03	13.35	17.35	0.50	13.35	7.69	7.25	14.94	5.29	.....	7.54	.....	7.54	92.32	84.42	84.92
Marathon	94.97	89.37	23.07	27.19	0.05	27.24	12.73	11.35	24.06	17.55	.....	25.64	.....	25.64	143.12	141.20	141.25
Marquette	63.73	63.66	16.92	11.73	.....	11.73	9.11	17.36	26.47	13.26	.....	17.59	.....	17.59	112.11	93.30	93.30
Marquette	24.93	24.93	8.94	7.46	0.46	7.92	2.65	4.49	7.14	1.94	.....	6.00	.....	6.00	41.04	33.42	33.42
Milwaukee	151.35	151.35	11.80	11.80	.....	11.80	7.40	3.01	10.41	7.40	.....	10.41	.....	10.41	173.56	173.56	173.56
Monroe	65.13	57.39	23.16	23.10	0.98	23.08	8.39	15.73	24.12	7.13	.....	22.96	4.14	27.00	115.46	103.35	113.47
Oconto	46.33	43.93	19.27	19.27	.....	19.27	16.79	4.97	21.76	16.39	.....	21.96	0.40	21.76	87.36	83.61	84.01
Oshkosh	110.97	103.29	33.64	31.73	1.06	32.84	64.67	2.00	63.67	50.77	.....	52.77	5.75	53.62	211.23	187.84	194.65
Outagamie	74.39	63.93	46.17	51.53	.....	51.53	10.67	.....	10.67	7.13	.....	7.16	.....	7.16	131.23	125.67	125.67
Ozaukee	13.33	13.33	4.21	5.21	.....	5.21	7.47	2.04	9.51	6.13	.....	8.22	.....	8.22	32.30	29.39	29.39
Pepin	15.30	12.93	5.63	6.06	.....	6.06	4.00	2.93	6.93	3.74	.....	3.74	.....	3.74	27.93	22.73	22.73
Pierce	54.37	47.33	13.07	12.00	1.23	13.23	8.29	7.50	8.29	3.77	.....	3.77	0.77	4.54	75.63	63.15	63.15
Polk	79.16	73.61	27.33	24.67	2.11	26.78	16.44	16.84	33.28	22.50	.....	37.75	.....	37.75	139.77	133.03	137.14
Portage	76.13	63.32	26.69	23.63	5.23	23.63	0.92	9.22	10.14	5.89	.....	5.98	.....	5.98	112.96	103.11	103.11
Price	103.35	100.54	27.00	23.35	0.64	23.35	19.40	6.90	26.30	10.66	.....	17.56	.....	17.56	161.66	147.45	148.09
Racine	64.74	62.86	14.12	14.66	.....	14.66	5.00	7.89	12.89	7.02	.....	11.75	.....	11.75	91.76	89.27	89.27
Richland	62.08	59.07	5.55	6.27	.....	6.27	5.33	5.33	5.33	4.75	.....	4.75	.....	4.75	73.01	70.09	70.09
Rock	166.62	164.34	41.13	38.56	1.78	40.36	9.35	11.55	20.90	10.60	.....	14.93	.....	14.93	228.65	217.68	219.36
Rusk	74.50	70.03	4.47	5.47	3.47	8.94	3.85	3.85	3.85	3.85	.....	3.85	.....	3.85	32.82	29.35	32.82
St. Croix	64.10	33.51	24.16	16.11	1.44	17.55	2.08	8.71	10.79	8.88	.....	8.88	.....	8.88	99.05	73.50	79.94

TABLE VII.

COST OF STATE AID ROAD SURVEYS AND PLANS.

Showing, by counties, the number of miles of surveys made and plans completed, the total cost, and the average cost per mile. This work was done between August 15, 1917, and July 1, 1918, by the forces of the Highway Commission under surety contracts with the counties.

County	Cost of road surveys and plans from August 15, 1915, to July 1, 1916		Surveys made from July 1, 1916, to July 1, 1918			Plans completed from July 1, 1916, to July 1, 1918			Total cost to county	Average cost per mile of completed surveys and plans
	Total cost to county	Average cost per mile of completed surveys and plans	Miles	Cost	Cost per mile	Miles	Cost	Cost per mile		
Adams	\$5.56	.....	4.08	\$33.03	\$9.32	4.37	\$53.00	\$12.13	\$96.59	\$24.27
Ashland	374.06	.....	6.37	101.53	14.78	7.24	117.07	16.17	592.66	48.86
Barren	216.77	19.50	34.00	340.29	10.00	34.11	861.70	25.26	1,418.76	63.08
Bayfield	263.23	40.11	23.65	291.29	12.33	23.61	506.79	25.23	1,150.81	71.27
Brown	297.11	25.57	43.56	281.52	6.46	39.08	806.68	22.95	1,475.31	54.69
Buffalo	292.00	28.31	12.79	202.19	15.81	10.49	857.97	34.13	852.16	75.14
Burnett	.....	.....	11.98	106.28	8.91	3.48	113.44	32.30	931.72	28.63
Calumet	129.11	26.16	14.23	113.34	7.99	12.12	239.71	22.25	519.16	56.59
Chippewa	240.97	17.28	23.93	133.50	5.56	16.57	349.41	20.71	723.88	42.18
Clark	318.16	20.64	34.47	243.03	7.06	31.09	496.02	15.96	1,067.21	43.35
Columbia	569.53	23.81	50.84	594.26	11.81	46.25	1,620.36	33.58	2,784.05	78.96
Crawford	204.04	33.53	6.57	112.76	17.16	6.57	256.71	37.57	573.51	79.65
Dane	621.82	24.01	96.11	889.17	9.35	84.36	2,750.94	32.72	4,270.43	73.65
Dodge	540.57	19.56	37.62	370.22	9.84	36.52	1,061.43	29.06	1,972.22	60.97
Door	90.59	26.50	33.75	266.79	7.90	37.17	733.77	19.74	1,091.15	56.14
*Douglas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dunn	186.58	23.06	24.20	205.95	8.52	23.32	489.64	21.00	882.17	56.14
Eau Claire	213.21	20.99	37.40	290.01	6.96	32.21	740.28	22.98	1,213.50	54.00
Florence	211.12	19.78	5.53	53.27	-9.45	12.42	261.20	21.02	523.59	41.81
Fond du Lac	271.96	13.46	21.69	162.88	7.51	21.59	490.55	22.72	925.44	50.98

TABLE VII.—Continued.

County	Cost of road surveys and plans from August 15, 1915, to July 1, 1916		Surveys made from July 1, 1916, to July 1, 1918				Plans completed from July 1, 1916, to July 1, 1918				Total cost to county	Average cost per mile of completed surveys and plans
	Total cost to county	Average cost per mile of completed surveys and plans	Miles	Cost	Cost per mile	Miles	Cost	Cost per mile	Miles	Cost		
Forest	526.92	22.90	47.36	563.11	11.89	45.78	1,134.49	24.78			2,224.52	63.11
Grant	774.79	43.61	32.62	649.40	19.91	27.45	1,255.64	42.10			2,679.53	110.42
Green	340.04	24.44	36.74	463.00	12.60	29.79	966.06	32.43			1,769.10	74.58
Green Lake	44.33	30.72	9.59	81.07	8.45	11.36	189.07	16.64			314.47	51.22
Iowa	406.19	41.50	16.02	254.96	15.92	14.45	605.34	41.89			1,266.49	98.64
Iron	520.73	25.00	18.49	252.53	13.66	15.47	477.17	30.84			1,250.48	66.87
Jackson	293.77	24.62	18.42	223.89	12.15	20.11	628.36	31.25			1,079.02	76.48
Jefferson	844.66	25.31	30.19	231.71	9.33	25.69	829.52	32.25			1,455.88	69.79
Juneau	297.01	22.90	25.24	292.07	11.57	25.90	773.06	29.85			1,332.16	71.71
Kenosha	14.17		22.92	186.66	8.14	23.69	525.35	22.18			726.18	42.59
Kewaunee	74.67	26.90	12.46	109.76	8.81	14.45	302.77	20.95			487.20	57.54
La Crosse	298.60	34.42	35.38	413.03	11.70	33.77	1,070.79	31.76			1,782.42	76.37
La Fayette	507.86	34.05	26.56	437.93	16.49	21.06	781.17	37.09			1,726.95	88.20
Langlade	201.02	25.40	48.09	465.07	9.67	48.09	1,229.89	25.57			1,896.98	65.86
Lincoln	558.30	23.71	27.55	257.45	9.35	24.63	591.41	24.41			1,407.16	56.08
Manitowoc	238.26	22.92	27.18	214.63	7.90	24.02	497.86	20.73			950.85	52.91
Marathon	76.40	21.20	32.57	290.91	8.98	37.64	660.78	17.29			1,018.08	51.52
Marquette	275.21	20.58	33.86	375.47	11.09	23.87	448.63	18.59			1,094.31	51.81
Milwaukee	176.26	30.19	11.59	95.58	8.25	9.30	191.04	20.54			462.88	56.59
Monroe	263.30	25.89	34.38	420.30	12.23	32.93	1,005.75	30.54			1,689.35	75.65
Oconto	112.28	25.64	35.12	259.64	7.39	33.95	626.81	18.46			998.73	50.81
Oneida	745.86	25.88	92.83	1,122.54	12.43	75.88	2,088.78	27.53			3,987.30	69.63
Ozaukee	466.07	22.29	52.79	855.45	6.73	56.92	1,134.98	18.94			1,956.50	43.88
Ozaukee	147.47	30.13	11.69	98.74	8.45	9.41	255.90	27.30			502.11	63.72

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Pepin	102.15	22.50	9.63	124.54	12.86	9.72	309.91	31.83	536.90	76.25
Pierce	306.84	27.47	13.65	163.50	11.98	15.48	422.85	27.86	893.19	68.65
Polk	236.61	28.33	34.49	290.71	8.43	28.78	739.16	25.23	1,243.48	61.53
Portage	237.92	20.28	27.39	162.99	5.94	24.33	403.98	16.69	1,857.69	42.39
Price	659.12	21.51	43.37	466.35	10.76	40.47	839.83	20.75	1,865.25	54.03
Racine	454.34	26.62	22.30	173.29	7.86	18.02	440.59	24.45	1,070.22	57.30
Richland	259.44	33.53	10.63	178.12	10.08	3.55	244.73	44.50	1,682.29	54.86
Rock	664.86	23.71	43.11	286.31	6.71	43.56	1,103.16	24.78	2,036.23	54.27
Rusk	133.39	34.63	4.06	39.19	9.65	3.19	199.22	24.32	376.50	66.69
St. Croix	223.51	20.33	36.47	227.01	8.60	23.29	627.85	20.85	983.50	53.24
Sauk	399.45	27.39	43.19	505.34	10.49	46.35	1,396.11	32.30	2,300.90	77.37
Sawyer .....	.....	.....	.30	4.74	15.80	.30	11.22	37.33	15.96	50.32
*Shawano .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Sheboygan .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Taylor	113.12	20.33	28.43	242.21	14.76	22.75	437.13	21.41	842.46	54.11
*Trempealeau .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Vernon	323.33	40.70	2.60	56.82	21.47	5.75	215.00	37.39	597.19	97.90
Vilas	442.25	13.90	19.09	265.35	13.90	23.29	727.47	31.24	1,435.07	64.44
*Waikworth .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washburn .....	.....	.....	23.18	234.03	12.69	18.70	563.24	30.29	862.32	41.13
Washington .....	.....	.....	17.19	174.03	10.12	15.79	401.15	25.47	575.18	34.83
Waukesha	641.00	23.32	24.67	173.04	7.01	13.01	406.50	22.68	1,222.54	50.39
Waupaca	374.83	21.01	41.85	393.01	9.46	18.78	333.96	20.71	1,156.90	47.91
Waushara	149.74	23.21	22.30	187.07	8.39	20.80	336.43	14.49	735.24	55.95
Winnebago	161.63	21.47	11.00	101.20	9.20	12.53	305.74	24.40	568.57	53.20
Wood	396.55	19.42	40.94	432.98	10.33	31.10	537.42	17.23	1,355.95	43.16
Totals	\$19,021.50	\$24.79	1,776.40	\$17,899.24	\$10.76	1,632.17	\$41,845.47	\$25.64	\$78,730.10	\$92.39

* These counties have made their own surveys and plans throughout.

TABLE VIII.
FEDERAL AID SURVEYS AND PLANS.

Showing the miles and cost of Federal Aid Surveys made and plans completed by the Wisconsin Highway Commission during the fiscal year ending June 30th, 1918.

Wis. No. P. Tol.	Name of Road	County	Surveys			Plans			Total cost to date	Total cost per mile
			Miles	Cost	Cost per mile	Miles	Cost	Cost per mile		
1	Sheridan	Racine	4.82	\$101.89	\$23.20	3.16	\$127.96	\$40.49	\$229.85	\$73.69
2	Lake Shore	Manitowoc	2.25	25.28	10.23	2.25	153.03	68.00	178.31	79.23
14	Shawano-Green Bay	Shawano	7.34	256.35	34.75	7.34	315.43	42.97	571.88	77.72
5	Peabigo-Oconto	Oconto-Marquette	9.90	224.73	23.42	6.53	361.25	54.90	586.03	78.32
6	Green Bay-Oconto	Oconto	3.90	159.27	40.84	3.02	144.96	47.96	304.23	88.79
7	Watertown Plank	Wautesha	4.81	122.55	25.52	4.81	149.82	29.70	265.37	55.22
8	Madison Middleton	Dane	3.55	201.94	57.00	3.55	369.86	112.70	601.80	169.70
9	Green Bay-Kewaunee	Kewaunee	1.82	15.26	99.78	1.82	84.91	55.86	130.17	86.62
10	Elkhorn-Lake Geneva	Walworth	4.88	189.62	38.10	4.28	261.00	52.45	450.62	90.55
11	Loomis	Milwaukee	2.23	86.36	39.60	2.23	121.15	54.50	210.53	94.40
12	Madison-Sauk City	Dane	4.06	117.13	28.85	4.06	391.51	96.43	508.64	125.28
13	Owen-Abbotsford	Clark	8.81	184.20	22.48	8.81	356.99	41.19	557.19	63.07
14	Menomone-Hudson	Dunn	4.96	139.29	28.12	4.96	314.83	68.50	453.62	91.62
15	Hudson-Menomone	St. Croix	8.71	298.96	23.96	.....	.....	.....	208.96	23.96
16	Alma-Durand	Pepin	2.98	137.21	46.02	.....	.....	.....	137.21	46.02
17	Eau Claire-Chippewa Falls	Eau Claire-Chippewa	10.01	205.75	25.60	8.80	386.29	45.29	604.04	70.89
18	Rhineland-Enterprise	Oneida	2.00	120.59	60.80	2.00	157.52	78.76	278.11	139.06
19	Prentice-Phillips	Price	6.90	173.85	25.14	6.90	311.65	45.85	485.50	70.99
20	Antigo-Rhineland	Langlade	6.76	210.99	32.60	6.21	196.44	31.55	407.43	64.05
21	Green Bay-Appleton	Brown	6.64	160.77	24.23	5.76	279.71	48.55	440.48	72.77

22	Turtle Lake-Centuria.....	Polk	16.64	353.41	21.29	15.25	734.68	46.15	1,093.09	69.44
23	Merrill-Tomahawk Lake.....	Lincoln	5.62	139.00	24.85	5.62	154.53	27.51	294.43	52.36
24	Black River Falls-Melrose	Jackson	3.12	161.67	51.81	3.12	271.12	66.98	432.79	138.79
25	Endeavor-Packwaukee	Marquette	4.49	161.57	38.00	4.16	305.00	73.30	466.57	109.30
26	Grand Rapids-Plover	Wood	2.82	51.48	18.25	2.82	120.09	42.85	171.57	61.10
27	Armstrongs-Fence	Florence-Forest	6.28	320.13	51.05	6.28	299.87	47.70	690.00	98.75
28	La Crosse-Sparta	La Crosse	8.53	93.31	27.05	8.53	253.47	77.25	352.78	104.30
29	Stuel Lake-Cumberland	Washington-Barron	10.65	840.58	52.00	9.85	523.77	52.70	864.35	184.70
30	Sheridan	Kenosha	1.87	85.98	30.30	1.87	104.78	53.10	203.77	103.30
31	Phillips-Medford	Taylor	7.89	134.27	26.34				134.27	26.34
32	Fond du Lac-Oshkosh	Winnebago	4.57	143.41	32.50	4.57	204.57	44.75	352.98	77.25
33	Fond du Lac-Oshkosh	Fond du Lac	4.46	198.01	43.33	4.46	200.43	44.53	353.44	88.16
34	Lake to River	Iowa	9.56	354.86	37.10	9.56	584.89	61.10	639.74	96.20
35	Horicon-Mayville	Dodge	4.69	78.61	16.35	4.70	340.72	73.81	417.33	90.16
36	South Chicago Ave.	Milwaukee	0.78	(*)		0.78	58.30	74.70	58.30	74.70
37	Stevens Point-Wausau.....	Portage	7.00	192.12	27.40	5.98	254.72	42.60	446.84	70.00
38	Stevens Point-Wausau.....	Marathon	11.35	259.06	22.82	8.09	390.62	49.00	649.68	71.82
39	Sheridan	Racine	3.07	103.74	33.80	1.57	89.54	57.00	133.28	90.80
40	Green Bay-Milwaukee	Sheboygan	4.65	218.88	47.04	4.65	176.80	38.03	395.68	85.07
41	Lancaster-Platteville	Grant	2.85	134.86	47.30	2.85	304.13	100.68	433.99	147.98
42	Beloit-Janeville	Rock	11.55	235.42	30.36	4.06	485.76	119.60	721.18	139.96
43	Blair-Ettrick	Trempealeau	5.00	485.67	97.13	5.00	332.48	76.45	868.15	173.58
44	Kilbourn-Mauston	Juneau	11.81	333.77	28.25				333.77	28.25
45	Hurley-Ashtland	Ashtland	12.31	445.80	36.20	9.69	621.34	64.30	1,067.14	100.50
46	Wautoma-Red Graulte.....	Waushara	10.43	268.83	25.75				268.83	25.75
47	Viroqua-Readstown-Richland Center.....	Vernon	8.25	435.69	52.95	8.25	242.92	52.85	678.61	105.70
48	Mauston-Sparta	Monroe	15.73	831.81	52.95	15.73	1,091.61	69.38	1,923.42	122.33
49	Appleton-Waupaca	Waupaca	11.07	295.91	25.80	10.10	463.53	45.86	749.44	71.66
50	Milwaukee-Cedarburg-Pt. Washington.....	Ozaukee	2.04	79.61	39.05	2.04	94.50	48.10	174.11	85.15
51	Portage-Wyocena	Columbia	9.98	227.91	22.85				227.91	22.85
52	Hunters Bridge.....	La Crosse	5.17	106.67	30.64	5.17	248.18	48.00	354.85	66.64
	Fountain City-Winona	Buffalo	6.31	615.83	62.90				615.83	62.90
	Plank Road.....	Dodge	1.57	80.83	19.72				80.83	19.72
	Algoma-Sturgeon Bay.....	Door	6.68	137.50	20.77				137.50	20.77
	Menomonie-Eau Claire.....	Dunn	4.77	76.64	16.06				76.64	16.06

TABLE VIII—Continued.

Wis. Proj. No.	Name of Road	County	Surveys			Plans			Total cost to date	Total cost per mile
			Miles	Cost	Cost per mile	Miles	Cost	Cost per mile		
	Monroe-Monticello	Green	9.80	\$801.63	\$82.45				\$801.63	\$82.45
	Green Lake-Berlin	Green Lake	7.56	219.93	29.09				219.93	29.09
	Algoma-Sturgeon Bay	Kewaunee	2.04	42.85	20.77				42.85	20.77
	Darlington-Mineral Point	Lafayette	11.97	201.23	16.84				201.23	16.84
	Manitowoc-Sheboygan	Manitowoc	5.00	111.64	22.32				111.64	22.32
	Crivitz-Beaver	Marquette	8.33	333.78	.....				333.78	.....
	Ellsworth-River Falls	Pierce	7.50	201.53	26.90				201.53	26.90
	Plover-Grand Rapids	Portage	2.22	63.65	28.80				63.65	28.80
	Pond du Lac	Washington	2.33	104.99	35.80		\$141.30	\$48.25	246.29	84.05
	Plank	Jefferson	1.37	40.03	19.72				40.03	19.72
	Totals .....	.....	404.37	\$12,511.11	\$31.73	249.60	\$13,663.51	\$54.75	\$26,480.62	\$66.53

* Proj. No. 3 surveyed. Plans made under State Aid Law.

* Surveyed by Milwaukee County Highway Dept. Cost not available.

TABLE IX.

BRIDGE SURVEYS AND PLANS.

Showing by counties, the number of bridge surveys made and number of bridge plans mailed for State Aid and County Aid bridges, by the State Highway Commission, during the period from July 1, 1911, to July 1, 1916, and for the fiscal years 1916-1917 and 1917-1918 with totals for the entire period from July 1, 1911, to July 1, 1918. The "Surveys Made" columns represent surveys by the State Highway Commission's own employees, the "Local Surveys" were made by town, county or other local officials.

County	Total from July 1, 1911, to July 1, 1916						1916-17						1917-18						Total from July 1, 1911, to July 1, 1918					
	State Aid			County Aid			State Aid			County Aid			State Aid			County Aid			State Aid			County Aid		
	Plans sent		Surveys made	Plans sent		Surveys made	Plans sent		Surveys made	Plans sent		Surveys made	Plans sent		Surveys made	Plans sent		Surveys made	Plans sent		Surveys made	Plans sent		Surveys made
	made	made		made	made		made	made		made	made		made	made		made	made		made	made		made	made	
Adams	13	8	6	4	3	3	8	0	0	0	0	0	2	2	2	0	0	3	13	6	9	0	0	7
Ashland	4	3	10	8	0	0	0	1	1	2	2	2	2	2	2	0	0	0	5	5	11	0	0	9
Barron	23	18	38	45	12	12	12	13	2	14	0	0	0	0	0	1	2	35	30	52	3	0	61	
Barfield	24	25	11	8	5	5	1	0	0	0	0	0	0	0	0	0	7	29	30	10	0	0	15	
Brown	15	12	42	38	6	6	12	0	12	1	1	1	1	1	1	7	7	22	19	61	0	0	57	
Buffalo	33	30	16	11	8	8	8	1	3	4	0	0	0	0	0	2	0	41	38	19	3	17	17	
Burnett	7	2	17	16	1	1	1	7	0	7	1	0	0	0	0	0	0	3	3	24	0	0	23	
Oshtemo	14	8	14	14	3	3	1	0	1	1	7	7	9	7	9	0	9	17	18	24	0	0	24	
Chippewa	13	13	40	35	1	1	1	4	5	9	0	0	0	0	0	1	0	1	19	14	45	5	45	
Clark	46	46	20	16	1	1	1	2	1	3	0	0	0	0	0	0	0	47	49	22	1	19	19	
Columbia	21	22	9	10	2	2	2	0	0	0	0	0	2	2	2	1	1	25	28	10	1	12	12	
Crawford	23	21	14	12	6	4	0	0	0	0	5	5	3	3	3	0	0	33	30	14	0	12	12	
Dane	63	64	127	113	14	13	14	2	16	3	16	3	12	12	12	0	12	80	80	153	2	2	141	
Dodge	12	6	11	9	2	1	0	0	0	0	3	3	6	6	6	0	6	17	17	10	0	0	15	
Door	5	5	5	4	6	6	1	0	1	0	1	11	11	11	0	0	0	22	22	6	0	0	5	
Douglas	23	21	9	10	6	5	5	5	0	5	1	1	1	1	7	0	5	30	27	21	0	0	20	
Dunn	26	24	26	25	4	4	4	6	3	9	0	0	0	0	1	9	10	30	28	33	12	44	44	
Eau Claire	7	6	63	57	1	1	1	1	7	8	1	1	1	1	4	1	5	9	8	68	8	70	70	
Florence	1	1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	0	2	2	
Fond du Lac	11	10	8	10	0	0	0	0	0	0	1	0	0	0	3	0	3	12	10	11	0	0	12	

TABLE IX—Continued.

County	Total from July 1, 1911, to July 1, 1916					1916-17					1917-18					Total from July 1, 1911, to July 1, 1918				
	State Aid		County Aid			State Aid		County Aid			State Aid		County Aid			State Aid		County Aid		
	Surveys made	Plans sent	Surveys made	Plans sent	Local surveys	Surveys made	Plans sent	Surveys made	Plans sent	Local surveys	Surveys made	Plans sent	Surveys made	Plans sent	Local surveys	Surveys made	Plans sent	Surveys made	Plans sent	Local surveys
Forest	15	15	3	4	0	7	7	3	3	0	3	3	0	0	0	24	24	6	0	7
Grant	72	71	30	24	0	8	8	6	2	0	5	2	2	0	0	33	70	33	0	29
Green	28	22	34	26	0	8	8	2	1	0	2	2	0	0	0	33	31	36	0	23
Green Lake	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
Iowa	15	14	4	4	1	4	4	3	0	1	4	0	1	0	0	19	13	8	1	8
Iron	7	6	8	6	0	1	1	0	1	0	0	1	0	0	0	10	8	8	0	6
Jackson	44	41	30	23	2	5	5	2	4	1	4	3	1	0	1	52	49	40	3	36
Jefferson	11	9	27	25	2	1	1	2	4	1	4	1	3	0	3	13	11	32	2	32
Juneau	32	29	25	16	3	3	3	3	0	0	3	0	0	0	0	35	32	23	0	19
Kenosha	12	10	9	11	0	8	8	8	0	0	8	1	0	2	0	16	13	19	0	21
Kewaunee	35	38	31	24	0	10	10	17	0	0	17	3	4	0	4	43	51	52	0	45
La Crosse	51	51	76	68	14	5	5	14	0	0	14	1	4	0	4	57	57	94	0	86
Lafayette	31	25	34	42	3	16	14	18	3	3	19	2	6	0	6	49	41	58	3	67
Langlade	8	7	8	6	0	2	2	3	0	0	3	2	2	0	3	12	11	14	0	12
Lincoln	32	29	40	41	0	7	7	9	0	0	9	2	2	4	0	41	38	53	0	54
Manitowoc	26	28	63	71	0	7	7	16	0	0	16	0	5	0	5	33	35	84	0	92
Marathon	45	38	18	22	2	7	7	3	0	0	2	2	2	0	2	54	48	22	0	26
Marquette	4	4	9	7	0	3	3	3	0	0	0	3	0	0	0	10	10	11	0	9
Marquette	2	2	4	3	0	1	1	1	0	0	1	1	1	1	1	11	8	5	1	5
Milwaukee	19	19	7	7	0	6	6	3	0	0	3	0	0	2	1	25	25	12	1	12
Monroe	13	18	32	31	0	1	1	22	0	0	17	1	5	0	5	15	15	59	0	53
Oconto	14	14	32	33	0	2	2	8	0	0	8	1	1	0	14	17	17	61	0	60
Oconto	10	8	32	17	0	2	4	3	0	0	2	5	3	0	2	19	17	27	0	31
Outagamie	20	16	21	22	0	2	2	3	0	0	3	3	0	0	0	24	20	24	0	25
Ozaukee	4	3	9	10	0	1	1	4	0	0	4	2	2	0	0	7	5	15	0	16

Popln	41	36	97	84	11	11	23	6	29	1	1	1	8	0	0	5	8	29	0	28
Price	47	40	12	12	1	1	2	0	2	1	1	1	8	0	0	3	48	123	6	131
Portage	24	23	25	21	0	0	3	0	3	0	0	0	2	0	0	2	24	30	0	26
Price	8	8	6	7	2	1	0	1	1	0	0	0	0	0	0	10	9	6	1	8
Racine	7	7	15	14	1	1	0	0	0	3	3	3	0	0	0	11	11	15	0	14
Richland	87	85	17	15	11	11	3	5	8	5	5	5	2	0	0	2	53	51	22	25
Rock	78	61	28	27	10	10	4	2	6	7	7	7	1	1	1	3	90	78	33	38
Rusk	21	21	53	56	0	0	3	0	3	1	1	1	6	0	0	6	23	22	61	65
St. Croix	28	32	54	52	7	7	9	0	9	0	0	0	7	0	0	7	35	39	70	68
Sauk	29	30	34	22	5	4	6	0	6	4	4	4	2	0	0	2	38	38	42	30
Sawyer	1	1	12	11	3	3	2	0	1	0	0	0	6	0	0	5	4	20	0	17
Shawano	13	13	53	60	10	10	9	0	9	0	0	0	0	0	0	23	23	62	0	69
Sheboygan	16	13	26	23	1	1	6	0	5	0	0	0	8	0	0	17	14	40	0	36
Taylor	4	3	4	4	1	1	3	0	3	2	2	2	5	1	6	7	6	11	1	12
Trempealeau	16	17	47	64	13	13	3	2	5	1	1	1	5	3	8	30	31	55	5	77
Vernon	39	38	12	8	15	15	2	0	2	5	5	5	0	0	0	59	53	14	0	10
Vilas	2	2	4	4	0	0	2	0	1	2	2	2	2	0	1	4	4	8	0	6
Walworth	15	17	10	9	1	1	2	0	2	0	0	0	0	0	0	15	13	12	0	11
Washburn	3	4	13	6	0	0	1	0	1	0	0	0	0	0	0	3	4	14	0	7
Washington	5	4	9	7	2	2	1	0	1	1	1	1	1	0	0	8	7	11	0	8
Waushara	14	10	29	20	1	1	4	0	4	0	0	0	4	0	0	15	11	37	0	23
Waupaca	2	2	32	32	3	3	3	0	3	0	0	0	0	0	0	5	5	25	0	35
Waunakee	5	5	8	10	2	2	7	0	7	1	1	1	0	0	0	8	8	16	0	17
Winnebago	13	12	9	9	4	4	8	0	3	1	1	1	2	1	3	18	17	14	1	15
Wood	33	35	11	10	8	8	6	0	6	7	7	7	0	1	1	48	51	17	1	17
Total.....	1,434	1,332	1,714	1,603	308	297	328	47	363	121	117	206	22	217	1,863	1,746	2,247	60	2,183	

TABLE X.

TOTAL MILEAGE GRADED.

Showing by counties the total mileage of road graded under the State Aid Law to 1915 inclusive, the mileage graded by years 1916 and 1917, the grand total graded to January 1, 1918, with an estimate of the amount graded in 1918. The figures shown give the net mileage graded and drained only, plus the mileage of all types of surfacings since the beginning of State Aid construction.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Adams	13.21	1.52	0.90	15.63	3.75
Ashland	06.24	13.26	10.43	29.93	5.00
Barron	77.53	15.10	12.85	105.48	11.50
Bayfield	42.19	23.61	4.50	73.30	2.25
Brown	75.24	8.46	4.43	88.13	24.00
Buffalo	32.33	9.60	6.13	48.06	8.50
Burnett	22.32	14.58	5.50	43.40	13.00
Calumet	10.81	5.09	1.04	16.94	9.25
Chippewa	43.48	12.87	7.98	63.33	4.00
Clark	103.18	22.60	17.11	142.89	14.33
Columbia	78.36	23.53	26.55	128.44	13.50
Crawford	15.33	5.73	2.25	23.32	0.50
Dane	141.37	34.87	29.60	205.84	10.40
Dodge	85.85	22.32	15.13	123.30	12.50
Door	61.33	15.19	17.47	94.49	10.75
Douglas	55.19	32.60	19.41	107.20	5.40
Dunn	25.81	9.94	13.15	48.90	0.03
Eau Claire	21.78	12.81	10.04	44.63	10.00
Florence	35.22	2.33	3.25	40.80	4.00
Fond du Lac	39.20	9.94	7.76	56.90	10.00
Forest	53.31	15.17	21.86	100.34	17.50
Grant	52.13	16.64	14.86	83.63	6.10
Green	71.68	17.07	11.34	100.09	1.42
Green Lake	18.08	5.63	5.61	29.32	2.50
Iowa	32.33	7.33	4.72	44.38	4.00
Iron	40.96	12.25	9.36	63.07	10.00
Jackson	66.98	15.43	9.51	91.97	11.00
Jefferson	56.11	15.95	12.29	84.35	10.00
Juneau	45.01	15.75	9.88	70.64	4.00
Kenosha	41.43	9.29	10.92	61.64	7.75
Kewaunee	22.66	4.47	6.37	33.50	4.00
La Crosse	46.86	19.77	11.44	78.07	16.64
Lafayette	43.37	8.23	7.07	63.72	4.00
Lanai	40.97	16.31	22.71	79.99	11.25
Lincoln	81.40	25.30	12.93	119.63	20.00
Manitowoc	41.33	11.59	6.85	59.77	9.00
Marathon	70.89	16.25	15.96	103.10	8.50
Marinette	79.34	23.32	12.53	115.19	10.00
Marquette	14.23	7.00	6.63	27.86	6.50
Milwaukee	106.33	26.39	17.68	150.40	6.12
Monroe	52.08	12.77	12.98	77.83	8.30
Oconto	40.09	9.22	16.93	66.24	15.00
Oneida	64.52	28.06	41.58	134.16	33.00
Outagamie	39.40	19.66	21.34	80.40	25.00
Ozaukee	10.34	3.95	3.50	17.79	3.60
Pepin	6.33	3.14	5.25	14.72	4.45
Pierce	33.31	12.03	7.43	52.77	5.60
Polk	57.92	17.74	16.35	92.01	6.00
Portage	52.24	15.63	8.74	76.61	3.75
Price	71.42	23.46	23.59	123.47	21.00

TABLE X—Continued.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Racine	33.68	10.67	9.71	54.06	11.70
Richland	46.84	3.13	1.88	51.85	3.00
Rock	133.26	27.79	29.71	190.76	19.00
Rusk	173.86	3.76	6.00	183.62	4.00
St. Croix	56.65	16.25	11.14	78.04	5.80
Sauk	94.63	14.61	18.32	127.56	11.00
Sawyer	30.16	6.76	18.22	55.14	9.50
Shawano	44.77	10.94	12.18	67.89	9.00
Sheboygan	42.57	12.13	8.54	63.24	15.50
Taylor	46.10	8.82	9.72	64.64	8.00
Trempealeau	41.09	13.22	23.71	78.03	16.00
Vernon	45.64	14.58	12.00	72.22	12.00
Vilas	52.27	22.75	16.82	91.84	15.00
Walworth	33.43	8.90	14.03	56.36	6.40
Washburn	29.23	12.32	7.69	49.24	12.25
Washington	21.68	5.65	4.49	32.12	3.00
Waukesha	44.87	11.81	13.28	69.96	4.00
Waupaca	41.20	18.27	11.75	71.22	8.00
Waushara	31.53	8.40	11.25	51.18	6.50
Winnebago	35.51	6.65	1.49	43.65	1.65
Wood	78.10	26.17	17.45	121.72	1.13
Totals.....	3,687.44	1,001.99	863.58	5,553.01	644.80

TABLE XI.

MILEAGE OF ROADS GRADED AND DRAINED ONLY.

Showing by counties the total mileage of road graded but not surfaced to 1915 inclusive, the mileage graded but not surfaced by year in 1916 and 1917, the total mileage graded but not surfaced to January 1, 1918, with an estimate of the amount graded but not surfaced in 1918. Note that the net totals for the six years given in the fourth column do not equal the totals of the preceding annual columns. This is due to the fact that part of the mileage reported as graded and drained each year, was surfaced the succeeding year, and therefore, appears again in the mileage given in the tables for surfacings, and is rightly deducted in arriving at the net totals given.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Adams	7.77	0.67	0.04	8.48	2.00
Ashland	49.98	3.16	2.75	55.89	2.50
Barron	75.90	15.10	11.94	102.94	11.50
Bayfield	35.47	26.61	4.50	66.58	.....
Brown	18.32	4.04	1.91	24.27	18.00
Buffalo	22.51	6.01	4.60	33.12	2.00
Burnett	18.56	11.96	4.91	35.43	8.00
Calumet	5.73	1.42	0.77	7.92	.....
Chippewa	14.57	5.25	.....	19.82	4.75
Clark	88.06	13.40	5.73	107.19	4.36
Columbia	11.68	3.13	3.36	18.17	.....
Crawford	13.13	4.40	1.75	19.28	0.50
Dane	51.07	19.52	20.57	91.16	10.25
Dodge	14.21	3.49	1.37	19.07	3.50
Door	2.00	2.86	3.40	8.26	.....
Douglas	43.02	27.38	16.53	86.93	5.40
Dunn	11.77	2.63	2.76	17.16	.....
Eau Claire	5.44	1.18	0.47	7.09	5.00
Flora	32.48	1.63	2.26	36.37	2.25
Fond du Lac	2.55	2.16	0.32	5.03	0.50
Forest	61.99	15.17	21.54	98.70	17.10
Grant	28.54	10.35	12.62	51.51	0.80
Green	10.33	6.66	2.93	19.92	.....
Green Lake	5.47	0.51	0.23	6.21	.....
Iowa	18.27	4.20	2.51	24.98	3.50
Iron	37.17	8.79	8.12	54.08	10.00
Jackson	30.48	6.92	5.75	43.15	8.50
Jefferson	5.94	5.02	1.10	12.06	1.00
Juneau	17.51	6.86	4.10	28.47	2.75
Kenosha	9.00	4.33	2.33	15.66	.....
Kewaunee	1.82	.....	.....	1.82	1.00
La Crosse	9.55	7.38	5.37	22.25	13.80
Lafayette	40.75	7.93	7.07	55.75	4.00
Langlade	40.97	13.93	22.71	77.61	11.25
Lincoln	73.68	24.51	10.68	108.77	18.00
Manitowoc	1.80	0.03	.....	1.83	.....
Marathon	46.41	12.58	11.05	70.04	5.40
Marinette	53.75	16.35	11.30	81.40	10.00
Marquette	1.79	0.62	0.10	2.51	0.50
Milwaukee	6.58	3.82	.....	10.40	.....
Monroe	19.34	6.46	7.14	32.94	2.90
Oconto	11.02	2.31	10.49	23.82	.....
Oneida	61.88	24.06	39.01	124.95	33.00
Outagamie	12.71	3.37	5.01	21.09	3.00
Ozaukee	0.71	.....	.....	0.71	0.20

TABLE XI—Continued.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Pepin	0.79	0.84	0.52	2.15	0.79
Pierce	21.08	9.22	3.26	33.56	1.39
Polk	47.77	11.27	7.24	66.28	6.00
Portage	12.21	4.12	4.67	21.00	1.25
Price	70.62	28.46	22.37	121.45	21.00
Racine	5.15	0.43	2.87	8.45	6.20
Richland	29.02	0.91	1.49	31.42	0.75
Rock	2.75	0.20	0.42	3.37	1.00
Rusk	196.93	2.34	6.00	175.27	4.00
St. Croix	38.71	7.66	5.60	51.97	2.25
Sauk	16.78	2.88	9.15	28.81	2.00
Sawyer	29.36	6.76	18.22	54.34	9.50
Shawano	27.92	6.17	6.49	40.58	7.75
Sheboygan	5.33	3.56	1.98	10.87	3.00
Taylor	38.50	8.10	6.90	53.50	7.00
Traverse	9.45	4.70	13.83	27.98	10.00
Vernon	42.31	12.36	12.00	66.67	12.00
Vilas	47.16	18.96	16.82	82.94	14.00
Walworth	4.98	0.49	0.62	5.94	.....
Washburn	27.71	11.76	7.69	47.16	12.25
Washington	0.68	1.63	0.21	2.52	.....
Waukesha	8.56	1.95	1.55	12.06	.....
Waupaca	18.79	2.46	3.44	19.69	1.00
Waushara	6.62	3.35	2.39	12.36	1.50
Winnebago	5.07	2.88	0.44	8.39	.....
Wood	61.48	21.86	15.18	98.52	18.66
Totals	1,872.36	523.43	452.25	2,848.04	365.50

TABLE XII.

MILEAGE SURFACED WITH CRUSHED STONE.

Showing by counties, the total mileage of road surfaced with crushed stone under the State Aid Law to 1915 inclusive, the mileage surfaced by year in 1916 and 1917, the total mileage so surfaced to January 1, 1918, with an estimate of the amount surfaced in 1918.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Adams	1.58	1.40	0.28	3.26	.....
Ashland	4.00	.....	.....	4.00	.....
Barron .....	.....	.....	.....	.....	.....
Bayfield .....	.....	.....	.....	.....	2.25
Brown	43.98	5.96	4.27	54.21	4.00
Buffalo	3.30	2.31	1.36	6.97	1.00
Burnett .....	.....	.....	.....	.....	.....
Calumet	7.51	2.99	0.78	11.28	9.00
Chippewa	8.46	3.53	2.67	14.71	2.25
Clark	3.10	0.47	.....	3.57	.....
Columbia	28.67	3.59	10.72	47.98	1.50
Crawford .....	.....	.....	.....	.....	.....
Dane	38.56	16.32	5.29	110.67	2.20
Dodge	42.38	8.51	3.99	54.88	5.50
Door	60.22	12.52	14.58	87.32	11.25
Douglas	6.94	0.76	.....	7.70	2.00
Dunn .....	.....	.....	.....	.....	.....
Eau Claire	4.75	.....	.....	4.75	.....
Florence	6.17	.....	.....	6.17	2.25
Fond du Lac	22.56	7.78	4.45	34.79	5.25
Forest	1.02	.....	.....	1.02	.....
Grant	29.26	6.02	2.22	37.50	4.20
Green	51.38	6.39	4.97	62.74	1.42
Green Lake	10.07	4.73	4.87	19.67	1.75
Iowa	7.13	1.88	1.52	10.53	.....
Iron	1.60	.....	.....	1.60	.....
Jackson .....	.....	.....	.....	.....	.....
Jefferson	18.56	0.64	0.59	19.79	.....
Juneau	20.13	6.90	3.69	30.77	1.25
Kenosha	10.12	1.96	0.47	12.55	1.00
Kewaunee	9.22	1.50	1.00	11.72	.....
La Crosse	40.32	14.52	11.05	65.89	5.40
Lafayette	7.20	0.35	.....	7.55	.....
Langlade .....	.....	.....	.....	.....	.....
Lincoln .....	.....	.....	.....	.....	.....
Manitowoc	12.15	1.61	0.49	14.25	4.42
Marathon	11.81	.....	0.18	11.99	.....
Marquette	0.32	0.07	.....	0.39	.....
Marquette	9.70	0.36	0.98	11.04	.....
Milwaukee	3.00	.....	.....	3.00	.....
Monroe	31.72	5.01	4.06	40.81	6.20
Oconto	11.85	.....	.....	11.85	.....
Oneida .....	.....	0.42	.....	0.42	1.00
Outagamie	25.33	3.18	1.78	30.29	2.00
Ozaukee	10.30	2.92	3.50	16.72	3.40
Pepin	0.51	.....	.....	0.51	.....
Pierce	1.99	.....	.....	1.99	.....
Polk	0.90	.....	.....	0.90	.....
Portage	30.02	5.95	4.53	40.50	.....
Price .....	.....	.....	.....	.....	.....

TABLE XII—Continued.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Racine	18.34	4.13	0.98	23.40	3.50
Richland	11.80	1.41	.....	12.71	2.25
Rock	37.93	3.10	0.74	41.77	1.50
Rusk .....	.....	.....	.....	.....	.....
St. Croix	0.45	0.25	.....	0.70	.....
Sank	72.62	8.76	6.83	88.21	10.00
Sawyer .....	.....	.....	.....	.....	.....
Shawano	4.74	0.21	0.74	5.69	.....
Sheboygan	14.67	2.90	1.33	18.90	5.50
Taylor .....	.....	.....	.....	.....	.....
Trempealeau	12.16	7.67	4.41	24.24	2.97
Vernon	3.49	2.12	0.42	6.03	.....
Vilas .....	.....	.....	.....	.....	.....
Walworth	12.67	5.04	1.67	19.38	.....
Washburn .....	.....	.....	.....	.....	.....
Washington	7.51	.....	0.45	7.96	.....
Waukesha	13.83	2.50	3.43	19.76	4.00
Waupaca	21.64	6.73	3.37	31.74	1.50
Waushara	18.30	3.75	3.14	25.19	2.25
Winnebago	14.28	2.66	2.73	19.65	0.81
Wood	12.36	1.31	.....	13.67	.....
Totals	964.11	188.64	124.50	1,277.25	115.77

The following fourteen counties reported no crushed stone surfacing during this period, viz.: Barron, Bayfield, Burnett, Crawford, Dunn, Jackson, Langlade, Lincoln, Price, Rusk, Sawyer, Taylor, Vilas and Washburn.

TABLE XIII.

MILEAGE SURFACED WITH GRAVEL.

Showing by counties, the total mileage of road surfaced with gravel under the State Aid Law to 1915 inclusive, the mileage surfaced by year in 1916 and 1917, the total mileage so surfaced to January 1, 1918, with an estimate of the amount surfaced in 1918.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Adams			0.58	0.58	1.75
Ashland	0.63	11.08	11.85	23.56	8.25
Barron	1.20			1.20	
Bayfield					
Brown	17.19	1.06	0.84	19.09	10.00
Buffalo					
Burnett		1.98		1.98	
Cahmet	1.17			1.17	1.00
Chippewa	21.06	5.36	9.31	35.73	.50
Clark	18.37	10.12	8.11	36.60	9.14
Columbia	34.77	14.09	18.06	66.12	12.00
Crawford					
Dane	17.73	5.84	6.64	30.21	6.80
Dodge	29.80	11.59	12.81	54.20	4.00
Door	0.54			0.54	
Douglas	1.09	3.97	3.71	9.37	5.50
Dunn	9.10	8.27	11.06	28.43	0.03
Eau Claire	6.81	4.32	7.06	18.19	
Florence	11.23	0.70	0.99	12.92	1.25
Fond du Lac	14.98		3.24	18.22	8.25
Forest			0.32	0.32	0.40
Grant	6.90	2.43	1.06	10.39	2.20
Green	8.05	5.80	2.52	16.37	
Green Lake	4.13	0.70	0.85	5.68	
Iowa					
Iron	0.32		1.74	2.06	
Jackson	0.34			0.34	
Jefferson	25.41	7.42	11.76	44.59	9.50
Juneau					
Kenosha	8.79	2.70	6.05	17.54	1.50
Kewaunee	10.40	5.07	5.38	20.85	3.00
La Crosse	3.96			3.96	
Lafayette	1.81			1.81	
Langlade		4.38		4.38	
Lincoln	7.50	4.95	9.50	21.95	6.00
Manitowoc	24.43	9.33	6.96	40.12	0.45
Marathon	0.66	0.65	3.12	4.33	0.50
Marquette	40.75	9.53	12.23	62.51	2.75
Marquette	2.74	1.99	2.55	7.28	6.00
Milwaukee					
Monroe		1.50		1.50	
Oconto	12.96	6.15	9.19	28.30	15.00
Oneida	2.64	3.22	3.64	9.50	2.00
Outagamie	1.46			1.46	
Ozaukee	1.68	1.29		2.97	
Pepin	3.99	2.40	4.16	10.55	3.65
Pierce	11.05	3.34	9.01	23.40	4.11
Polk	11.15	6.94	2.14	20.23	
Portage	9.04	9.36	1.14	19.54	2.50
Price	0.80	1.02	1.90	3.72	

TABLE XIII—Continued.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Racine	9.55	4.14	4.00	17.69	2.00
Richland	2.49	1.20		3.69	
Rock	94.75	25.34	28.80	148.89	9.25
Rusk	2.17	1.82		3.99	
St. Croix	18.79	13.23	4.92	31.94	5.10
Sauk	14.75	5.72	4.08	24.55	0.50
Sawyer					
Shawano	16.97	5.68	6.94	29.59	1.25
Sheboygan	17.96	5.26	4.32	27.54	5.00
Taylor	8.83	0.72	9.00	18.05	1.00
Trempealeau	1.65			1.65	2.00
Vernon					
Vilas					
Walworth	16.15	8.37	10.99	35.51	4.40
Washburn					
Washington	13.45	4.07	4.53	22.05	3.00
Waukesha	21.30	8.29	8.89	38.48	5.17
Waupaca	29.27	15.12	5.83	48.22	7.50
Waushara	5.94	2.69	6.44	15.07	5.00
Winnebago	15.87	0.83		15.75	0.88
Wood	1.59	1.27		2.86	
Totals	672.11	265.45	283.21	1,220.77	174.88

The following ten counties reported no gravel surfacings during this period, viz.: Bayfield, Buffalo, Crawford, Iowa, Juneau, Milwaukee, Sawyer, Vernon, Vilas and Washburn.

TABLE XIV.

MILEAGE SURFACED WITH CEMENT CONCRETE.

Showing by counties, the total mileage of road surfaced with cement concrete under the State Aid Law to 1915 inclusive, the mileage surfaced by year in 1916 and 1917, the total mileage so surfaced to January 1, 1918, with an estimate of the amount surfaced in 1918.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Adams					
Ashland					
Barron					
Bayfield					
Brown	4.78	0.05		4.78	1.00
Buffalo	0.53			0.53	
Burnett		0.09	0.09	0.18	
Calumet		1.17		1.17	
Chippewa					
Clark					
Columbia	0.53			0.53	
Crawford					
Dane	3.41	1.24	0.41	5.06	
Dodge	0.61			0.61	
Door					
Douglas	2.34			2.34	
Dunn					
Eau Claire	0.24	1.03	1.44	2.71	
Florence					
Fond du Lac	3.16			3.16	1.00
Forest					
Grant	0.24		0.05	0.29	
Green	1.39	1.16	1.08	3.63	
Green Lake					
Iowa	1.24			1.24	
Iron					
Jackson	0.70		0.01	0.71	
Jefferson		0.99		0.99	0.25
Juneau	0.09	0.04	0.09	0.22	
Kenosha	15.50	1.40	4.90	21.80	
Kewaunee	1.06			1.06	
La Crosse	1.11			1.11	
Lafayette					
Langlade					
Lincoln					
Manitowoc	2.21			2.21	
Marathon					
Marinette					
Marquette			0.04	0.04	
Milwaukee	87.70	19.60	20.97	128.36	8.00
Monroe	0.82	0.11	1.27	2.20	
Oconto					
Oneida					
Outagamie	1.03	13.47	17.81	32.31	20.00
Ozaukee					
Pepin					
Pierce		0.10		0.10	
Polk					
Portage	0.63			0.63	
Price					

TABLE XIV—Continued.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Racine	3.65	2.56	2.21	8.42	.....
Richland	0.88	1.19	.....	1.57	0.75
Rock	1.35	0.62	0.21	2.18	.....
Rusk .....	.....	.....	.....	.....	.....
St. Croix .....	.....	0.03	.....	0.03	.....
Sank	0.83	0.49	0.97	2.29	0.33
Sawyer .....	.....	.....	.....	.....	.....
Shawano .....	.....	.....	0.13	0.13	.....
Sheboygan	5.00	1.67	0.99	7.66	2.00
Taylor .....	.....	.....	.....	.....	.....
Trempealeau .....	.....	.....	.....	.....	.....
Vernon .....	.....	.....	.....	.....	.....
Vilas .....	.....	.....	.....	.....	.....
Walworth	1.64	.....	.....	1.64	2.00
Washburn .....	.....	.....	.....	.....	.....
Washington	0.57	.....	.....	0.57	.....
Waukesha .....	.....	.....	.....	.....	.....
Waupaca .....	.....	0.33	.....	0.33	.....
Wausara	0.12	0.22	0.11	0.45	.....
Winnebago	1.10	0.77	1.23	3.10	0.91
Wood	4.62	1.26	2.43	8.31	1.13
Totals.....	148.62	49.79	56.44	254.85	37.37

The following thirty-two counties reported no cement concrete surfacings during this period, viz.: Adams, Ashland, Barron, Bayfield, Chippewa, Clark, Crawford, Door, Dunn, Florence, Forest, Green Lake, Iron, Lafayette, Langlade, Lincoln, Marathon, Marinette, Oconto, Oneida, Ozaukee, Pepin, Polk, Price, Rusk, Sawyer, Taylor, Trempealeau, Vernon, Vilas, Washburn and Waukesha.

TABLE XV.

MILEAGE SURFACED WITH MISCELLANEOUS MATERIALS.

Showing by counties, the total mileage of road surfaced with miscellaneous materials under the State Aid Law to 1915, inclusive, the mileage surfaced by year in 1916 and 1917, the total mileage so surfaced to January 1, 1918, with an estimate of the amount surfaced in 1918. The footnotes give the mileage of the various types in each county, also a summary showing the total mileage of each type completed in the calendar years 1912 to 1918 inclusive.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Adams					
Ashland	16.13			16.13	
Barron			0.91	0.91	
Bayfield					
Brown					
Buffalo	5.44	4.00	4.06	13.49	1.00
Burnett					
Calumet					
Chippewa					
Clark	0.42	5.38	9.00	14.80	7.50
Columbia	5.84			5.84	
Crawford	2.20	0.80	0.40	3.40	
Dane					
Dodge					
Door					
Douglas					
Dunn	4.41			4.41	
Eau Claire	7.08	5.11		12.19	6.50
Florence	4.24	2.00		6.24	
Fond du Lac					
Forest					
Grant	0.17			0.17	
Green					
Green Lake					
Iowa	1.13	0.28		1.41	
Iron	1.87	3.46	1.34	6.67	
Jackson	25.51	5.19	4.24	34.94	2.75
Jefferson					
Juneau					
Kenosha					105.25
Kewaunee					
La Crosse					
Lafayette					
Langlade					
Lincoln					
Manitowoc	1.72	0.62		2.34	
Marathon	9.85	3.13	2.67	15.65	1.50
Marinette	1.19			1.19	
Marquette		4.03	3.02	7.05	
Milwaukee	10.95	2.97	0.52	14.44	0.12
Monroe	3.16	3.81	3.12	10.09	0.13
Oconto	2.80			2.80	
Oneida					
Outagamie					
Ozaukee					
Pepin	1.07			1.07	
Pierce					
Polk					
Portage	2.06			2.06	
Price					

TABLE XV—Continued.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 and 1915	1916	1917		
Racine		0.49		¹ 0.49	
Richland	5.63		0.39	¹ 6.02	² 1.50
Rock					
Rusk					
St. Croix					
Sauk	0.22	0.88		¹ 1.10	
Sawyer					
Shawano		0.72		⁷ 0.72	² 0.75
Sheboygan					
Taylor					
Trempealeau	16.86	5.86		¹ 22.72	² 7.00
Vernon		0.44		² 0.44	
Vilas					
Walworth	0.07		1.06	¹ 1.12	
Washburn			7.27	² 7.27	
Washington					
Waukegan	1.76			¹ 1.76	
Waupaca					
Waushara	3.03			⁷ 3.03	
Winnebago	0.92			¹ 0.92	
Wood			0.50	⁷ 0.50	
Totals	135.18	49.17	38.48	222.83	34.00

¹ Iron Ore. ² Shale. ³ Disintegrated Granite, 14.38; Brick, 0.42. ⁴ Shale, 4.51; Tar Macadam, 1.33. ⁵ Iron Ore, 2.24; Shale, 4.00. ⁶ Quarry Chips. ⁷ Disintegrated Granite. ⁸ Sandstone Block, 0.73; Tar Macadam, 1.97; Brick, 1.26; Asphalt, 10.48. ⁹ Shale, 9.15; Disintegrated Granite, 0.42; Brick, 0.52. ¹⁰ Asphaltic Concrete. ¹¹ Shale, 5.81; Asphaltic Macadam, 0.71. ¹² Slate, 0.59; Brick, 0.51. ¹³ Shale, 22.29; Brick, 0.43. ¹⁴ Brick. ¹⁵ Tar Macadam. ¹⁶ Bituminous Concrete.

The following thirty-six counties reported no miscellaneous surfacing during the period, viz.: Adams, Bayfield, Brown, Burnett, Calumet, Chippewa, Dane, Dodge, Door, Douglas, Fond du Lac, Forest, Green, Green Lake, Jefferson, Juneau, Kewaunee, La Crosse, Lafayette, Langlade, Lincoln, Oneida, Outagamie, Ozaukee, Pierce, Polk, Price, Rock, Rusk, St. Croix, Sawyer, Sheboygan, Taylor, Vilas, Washington, and Waupaca.

Summary of Mileage by Types: Iron Ore, 26.23; Shale, 129.10; Disintegrated Granite, 41.75; Brick, 4.26; Tar Macadam, 4.22; Quarry Chips, 2.51; Sheet Asphalt, 10.48; Sandstone Block, 0.73; Asphaltic Concrete, 2.25; Asphaltic Macadam, 0.71; Slate, 0.59.

TABLE XVI

SUMMARY OF TABLES X TO XV INCLUSIVE.

Showing by counties, the total mileage of the various types of road constructed under the State Aid Law in the calendar years 1912 to 1917, inclusive; the total mileage surfaced with hard materials; the total mileage constructed; and the percentage of the total mileage constructed which was hard surfaced.

County	Earth roads	Stone macadam	Gravel macadam	Concrete	Miscellaneous surfacings	Total hard surfacings	Total mileage constructed	Per cent surfaced
Adams	8.48	8.26	0.58	.....	.....	8.84	12.82	31.0
Ashland	55.89	4.00	23.56	.....	16.13	48.69	90.53	48.9
Barron	102.94	.....	1.20	.....	0.91	2.11	105.05	2.0
Bayfield	66.58	.....	.....	.....	.....	.....	66.58	.....
Brown	24.27	54.21	19.09	4.78	.....	78.08	102.35	76.4
Buffalo	83.12	6.97	.....	0.53	13.49	20.99	54.11	38.8
Burnett	35.43	.....	1.96	0.18	.....	2.16	37.59	5.8
Oaunmet	7.92	11.28	1.17	1.17	.....	13.62	21.54	68.3
Chippewa	19.82	14.71	35.78	.....	.....	50.44	70.26	71.9
Clark	107.19	8.57	36.60	.....	14.80	54.97	162.16	33.9
Columbia	18.17	47.96	63.12	0.53	5.84	117.47	135.61	86.6
Crawford	19.23	.....	.....	.....	3.40	3.40	22.68	15.0
Dane	91.16	110.67	30.21	5.06	.....	145.94	237.10	61.5
Dodge	19.07	54.88	54.20	0.61	.....	109.69	128.76	85.2
Door	8.26	87.32	0.54	.....	.....	87.86	96.12	91.4
Douglas	86.93	7.70	9.37	2.84	.....	19.41	106.84	18.2
Dunn	17.16	.....	28.43	.....	4.41	32.84	50.00	65.7
Eau Claire	7.09	4.75	18.19	2.71	12.14	37.79	44.88	84.1
Florence	36.37	6.17	12.92	.....	6.24	25.33	61.70	41.1
Fond du Lac	5.03	34.79	18.23	8.16	.....	56.17	61.30	91.7
Forest	98.70	1.02	0.82	.....	.....	1.84	100.64	1.3
Grant	51.51	37.50	10.88	0.29	0.17	43.84	99.55	48.4
Green	19.92	62.74	16.37	3.63	.....	82.74	102.66	80.7
Green Lake	6.21	19.67	5.09	.....	.....	25.36	31.56	80.4
Iowa	24.98	10.53	.....	1.24	1.41	13.18	38.16	84.5
Iron	54.08	1.60	2.06	.....	6.67	10.33	64.41	16.0
Jackson	43.15	.....	0.34	0.71	34.94	35.99	79.14	45.5
Jefferson	12.06	19.79	44.59	0.99	.....	65.37	77.43	84.3
Juneau	28.47	30.77	.....	0.22	.....	30.99	59.46	52.1
Kenosha	15.66	12.55	17.54	21.80	.....	51.89	67.55	76.9
Kewaunee	1.82	11.72	20.85	1.06	.....	33.63	35.45	95.0
La Crosse	22.25	65.89	3.96	1.11	.....	70.96	93.21	76.1
La Fayette	55.75	7.55	1.31	.....	.....	8.86	64.61	13.7
Langlade	77.61	.....	4.38	.....	.....	4.38	81.99	5.35
Lincoln	108.77	.....	21.95	.....	.....	21.95	134.72	16.8
Manitowoc	1.83	14.25	40.12	2.21	2.34	56.92	60.75	97.0
Marathon	70.04	11.99	4.33	.....	15.65	31.97	102.01	31.3
Marquette	81.40	0.39	62.51	.....	1.19	64.09	145.49	44.0
Marquette	2.51	11.04	7.23	0.04	7.05	25.41	27.92	91.0
Milwaukee	10.40	8.00	.....	128.36	14.96	146.32	156.72	93.3
Monroe	32.94	40.81	1.50	2.20	9.57	54.08	87.02	62.1
Oconto	23.82	11.86	28.30	.....	2.30	42.45	66.27	64.0
Ondaga	124.96	0.42	9.50	.....	.....	9.92	134.87	7.3
Outagamie	21.09	30.29	1.46	32.31	.....	64.06	85.15	75.2
Ozaukee	0.71	16.72	2.97	.....	.....	19.69	20.40	96.5
Pepin	2.15	0.51	10.55	.....	1.07	12.13	14.28	85.0
Pierce	38.56	1.99	23.40	0.10	.....	25.49	59.05	43.2
Polk	66.28	0.90	20.23	.....	.....	21.13	87.41	24.2
Portage	21.00	40.50	19.54	0.63	2.06	62.73	83.73	74.9
Price	121.45	.....	8.72	.....	.....	8.72	125.17	3.0

TABLE XVI—Continued.

County	Earth roads	Stone macadam	Gravel macadam	Concrete	Miscellaneous surfacings	Total hard surfacings	Total mileage constructed	Per cent surfaced
Racine	8.45	23.40	17.69	8.42	0.49	50.00	58.45	85.5
Richland	31.42	12.71	3.69	1.67	6.02	23.99	55.41	43.3
Rock	3.37	41.77	148.89	2.19	.....	192.64	196.21	98.4
Rusk	175.27	.....	3.99	.....	.....	3.99	179.26	2.2
St. Croix	51.97	0.70	31.94	0.08	.....	32.67	84.64	33.6
Sauk	28.81	88.21	24.56	2.29	1.10	116.15	144.96	80.2
Sawyer	54.34	.....	.....	.....	.....	.....	54.34	00.0
Shawano	40.58	5.69	29.59	0.13	0.72	36.13	76.71	47.1
Sheboygan	10.87	18.90	27.54	7.86	.....	54.30	65.17	83.3
Taylor	53.50	.....	18.06	.....	.....	18.06	71.56	25.2
Trempealeau	27.98	24.24	1.65	.....	22.72	48.61	76.69	63.5
Vernon	66.67	6.03	.....	.....	0.44	6.47	73.14	8.8
Vilas	82.94	.....	.....	.....	.....	.....	82.94	00.0
Walworth	5.94	19.38	30.51	1.64	1.12	52.65	58.59	90.0
Washburn	47.16	.....	.....	.....	7.27	7.27	54.43	18.3
Washington	2.52	7.96	22.05	0.57	.....	30.58	33.10	92.3
Waukesha	12.06	19.76	38.48	.....	1.76	60.00	72.06	83.2
Waupaca	19.69	31.74	48.22	0.33	.....	80.29	99.98	80.2
Wausara	12.36	25.19	15.07	0.45	3.03	48.74	56.10	78.0
Winnebago	8.39	19.65	15.75	3.10	0.92	39.42	47.81	82.4
Wood	98.52	13.67	2.68	3.31	0.50	25.34	123.86	20.3
Totals	2,848.04	1,277.25	1,220.77	254.86	222.88	2,975.70	5,823.74	51.0

TABLE XVII.

EXPENDITURES FOR STATE AID ROADS

Showing by counties the total expenditures for State Aid Road Construction to 1915, inclusive, the expenditures by year for 1916 and 1917, the total expenditures to January 1, 1918, with an estimate of the expenditures for 1918. For State Aid Bridge Construction, see Table XVIII.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 & 1915	1916	1917		
Adams	\$28,224	\$8,590	\$3,660	\$40,474	\$6,700
Ashland	156,628	31,915	27,501	216,089	15,899
Barron	58,607	25,182	25,673	147,462	28,000
Bayfield	54,621	22,941	22,337	99,899	5,000
Brown	283,807	34,765	31,897	350,469	15,000
Buffalo	72,034	31,609	27,465	131,101	5,500
Burnett	21,622	17,167	15,369	54,178	27,000
Calumet	40,008	25,996	4,133	70,137	25,000
Chippewa	109,907	40,747	39,562	190,216	11,642
Clark	118,908	37,743	39,685	191,231	38,168
Columbia	245,267	72,422	86,112	403,791	40,000
Crawford	41,428	14,911	5,588	61,927	5,010
Dane	529,426	141,105	128,905	799,396	49,922
Dodge	241,344	70,839	66,154	380,337	30,280
Door	119,705	35,985	53,446	209,136	21,458
Douglas	182,723	81,527	61,896	326,146	36,005
Dunn	57,502	20,900	37,912	116,314	810
Eau Claire	55,248	39,806	46,362	141,415	5,500
Florence	65,829	4,948	8,018	78,795	12,000
Fond du Lac	146,916	50,121	44,281	241,318	57,500
Forest	128,141	45,434	67,866	241,431	50,000
Grant	258,702	81,060	75,862	415,624	38,844
Green	253,780	88,698	68,046	409,499	11,928
Green Lake	65,706	21,377	21,578	108,661	12,561
Iowa	91,348	25,053	24,633	141,034	14,689
Iron	88,977	38,783	30,169	152,929	14,843
Jackson	111,437	24,619	23,374	159,430	15,272
Jefferson	167,480	69,855	56,832	294,147	35,000
Juneau	122,551	47,198	84,283	210,032	12,415
Kenosha	234,343	59,266	72,588	366,194	107,900
Kewaunee	76,572	17,870	20,608	115,050	15,000
La Crosse	199,470	81,402	66,062	346,934	46,026
La Fayette	115,621	25,981	18,729	160,331	12,000
Langlade	72,598	28,500	48,813	149,913	26,449
Lincoln	108,963	36,449	31,796	177,168	40,000
Manitowoc	144,811	35,366	23,610	203,787	39,898
Marathon	156,804	26,070	27,432	210,306	27,080
Marquette	144,379	38,827	30,387	213,593	16,165
Marquette	46,370	20,872	19,962	87,194	10,800
Milwaukee	1,862,621	474,731	498,226	2,835,578	200,000
Monroe	207,429	55,853	56,424	319,706	55,000
Oconto	78,120	15,301	27,951	121,372	25,870
Oneida	114,976	55,466	78,220	248,662	66,000
Outagamie	143,673	217,473	328,460	689,606	373,000
Ozaukee	50,367	19,407	22,060	91,824	20,800
Pepin	20,101	8,559	15,281	43,941	9,500
Pierce	77,896	28,565	20,101	126,562	12,539
Polk	100,379	38,778	38,660	177,807	13,154
Portage	142,097	35,381	24,468	201,943	5,900
Price	76,306	36,136	34,314	146,756	22,630

TABLE XVII—Continued.

County	Year of Construction			Totals six years	1918 construction (estimated)
	1912, 1913, 1914 & 1915	1916	1917		
Racine	170,567	85,117	97,620	353,304	70,000
Richland	184,448	35,427	7,517	177,892	30,646
Rock	303,210	79,930	99,642	482,782	58,700
Rusk	83,084	14,644	5,328	113,056	4,000
St. Croix	75,400	38,366	24,116	137,882	16,750
Sauk	416,433	70,546	80,223	573,207	56,500
Sawyer	30,002	13,656	13,707	57,367	7,800
Shawano	99,188	31,854	36,231	167,273	2,500
Sheboygan	196,259	73,002	50,374	320,135	69,365
Taylor	67,296	14,440	25,033	106,774	17,486
Trempealeau	133,762	50,279	57,095	250,136	35,000
Vernon	125,139	53,020	38,739	216,908	34,000
Vilas	87,969	22,445	15,083	125,467	15,000
Walworth	136,855	39,567	60,274	245,696	57,000
Washburn	34,353	21,912	13,161	69,456	15,796
Washington	96,055	18,563	24,540	139,158	12,000
Waukesha	137,803	33,912	59,083	285,748	52,148
Waupaca	154,737	60,769	39,646	255,148	22,300
Waushara	97,797	24,637	30,229	152,663	21,068
Winnebago	114,166	27,556	26,377	168,099	23,700
Wood	179,026	57,806	73,025	309,857	19,000
Totals	\$10,996,799	\$3,490,010	\$3,561,139	\$18,049,948	\$2,426,531

TABLE XVIII.

STATE AID BRIDGE CONSTRUCTION

Showing by counties, the number and cost of State Aid bridges constructed during the calendar years 1912 to 1915 inclusive, the same information by years for the calendar years 1916 and 1917, a grand total for the calendar years 1912 to 1917 inclusive and an estimate for the year 1918. These bridges have all been built under the provisions of the State Highway Law and directly supervised by the State Highway Commission. Note that the average cost per bridge has increased steadily. This is due partially to the better types of structures built in the later years and partially to increasing cost of labor and material.

County	Total 1912 to 1915 inclusive		1916		1917		Grand total 1912 to 1917 inclusive		Estimate for 1918	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Estimated cost
Adams	4	\$3,239.00	1	\$1,398.90	2	\$3,119.28	7	\$7,605.58	2	\$2,900.00
Ashland	1	550.00	1	916.80	1	4,794.44	3	6,261.24	1	6,318.00
Barron	15	12,687.73	3	6,052.00	8	9,972.81	26	28,712.04	.....	.....
Bayfield	15	25,960.48	3	13,460.00	2	3,170.00	20	42,590.48	.....	.....
Brown	12	14,923.90	3	4,457.59	2	19,261.12	17	38,642.61	.....	.....
Buffalo	13	12,226.75	12	12,086.00	4	10,220.57	29	34,483.32	1	2,650.00
Burnett .....	.....	.....	3	3,309.00	1	944.00	4	4,253.00	1	1,450.00
Calumet	8	11,620.00	.....	.....	3	3,474.00	11	15,094.00	3	2,640.00
Chippewa	9	19,838.16	4	4,136.00	1	899.00	14	24,863.16	.....	.....
Clark	35	28,396.57	5	3,111.95	.....	.....	40	31,508.52	3	3,918.00
Columbia	15	10,813.39	2	1,725.00	.....	.....	17	12,538.39	.....	.....
Crawford	10	8,126.94	4	4,407.87	2	1,872.82	16	14,407.08	1	5,020.00
Dane	48	34,973.77	12	9,372.86	10	8,596.43	70	52,743.06	.....	.....
Dodge	2	718.53	5	2,698.40	4	4,790.96	11	8,207.89	1	975.00
Door	4	1,935.00	2	1,445.10	7	4,040.90	13	7,421.00	8	3,448.00
Douglas	11	16,475.34	10	12,629.72	4	9,478.53	25	37,583.59	3	4,324.00
Dunn	17	22,502.00	6	6,229.69	4	4,061.65	27	33,393.34	.....	.....
Fau Claire	6	6,622.00	1	3,271.00	1	1,425.65	8	11,319.65	1	3,600.00
Florence .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fond du Lac	5	4,660.15	6	8,610.69	2	1,135.61	13	14,306.45	.....	.....
Forest	11	12,968.80	2	1,970.65	4	8,092.60	18	23,032.05	1	1,300.00
Grant	53	33,163.59	7	13,416.55	1	2,453.55	61	49,033.69	.....	.....
Green	7	13,202.06	7	9,342.49	3	7,335.71	17	29,880.26	2	5,645.00
Green Lake .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Iowa	12	7,735.48	1	1,198.71	1	724.50	14	9,658.69	.....	.....
Iron	3	4,612.00	1	2,092.65	.....	.....	4	6,704.65	2	3,125.00
Jackson	31	25,978.99	3	1,936.55	4	9,486.62	38	37,402.16	5	19,780.00
Jefferson	8	23,047.00	6	8,134.00	2	1,363.00	16	32,544.00	3	3,999.00
Juneau	17	13,880.88	7	12,398.38	1	1,213.05	25	27,492.31	.....	.....
Kenosha	4	3,767.00	5	3,319.00	.....	.....	9	7,076.00	.....	.....
Kewaunee	21	15,000.35	18	11,175.44	7	5,385.75	46	31,561.54	7	10,750.00
La Crosse	31	33,262.85	9	7,922.44	5	14,096.69	45	55,305.98	6	24,041.00
La Fayette	18	15,778.76	2	1,187.00	13	31,808.35	33	48,772.09	12	5,000.00
Langlade	5	3,667.42	1	2,119.00	3	13,944.25	9	19,730.73	.....	.....
Lincoln	17	10,750.70	4	4,400.69	4	4,742.04	25	19,893.43	3	3,000.00
Manitowoc	14	17,456.64	13	26,817.82	6	6,539.75	33	50,814.21	4	3,500.00
Marathon	27	32,262.85	8	45,537.57	6	15,837.78	41	93,638.20	2	3,931.00
Marquette	3	5,247.21	.....	.....	1	1,323.96	4	6,571.17	.....	.....
Marquette	2	4,636.15	.....	.....	1	3,445.00	3	8,081.15	.....	.....
Milwaukee	21	70,428.49	15	67,791.10	7	48,380.63	43	186,600.22	4	43,000.00
Monroe	8	6,822.00	1	931.63	.....	.....	9	7,753.63	.....	.....
Oconto	7	7,817.05	1	444.80	4	5,552.46	12	13,814.31	5	6,027.00
Oneida	4	2,686.00	4	2,296.00	3	2,315.00	11	7,297.00	6	8,742.00
Outagamie	6	5,423.98	1	1,298.12	1	1,672.00	10	8,394.10	2	3,200.00
Ozaukee	3	6,732.17	.....	.....	1	388.40	4	7,100.57	.....	.....

TABLE XVIII—Continued.

County	Total 1912 to 1915 inclusive		1916		1917		Grand total 1912 to 1917 inclusive		Estimate for 1918	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Estimated cost
Pepin	2	1,871.60	3	3,865.00	.....	.....	5	4,786.60	2	4,200.00
Pierce	27	41,891.01	12	11,415.01	6	10,514.60	45	68,820.62	2	2,743.00
Polk	23	16,205.81	2	1,507.00	4	2,280.49	29	19,993.30	.....	.....
Portage	13	8,397.54	7	5,822.57	.....	.....	20	14,220.11	.....	.....
Price .....	.....	.....	2	1,029.99	3	1,546.13	5	2,576.12	2	1,750.00
Racine	6	9,744.33	2	1,187.44	.....	.....	8	10,931.77	3	3,500.00
Richland	22	26,009.17	4	9,816.00	3	3,573.00	29	39,398.17	6	12,605.00
Rock	31	16,618.37	16	17,621.57	14	9,634.10	61	43,874.04	2	2,100.00
Rusk	8	26,580.35	1	23,562.50	2	1,150.00	11	50,242.85	.....	.....
St. Croix	18	13,325.60	11	6,776.80	4	3,063.94	33	23,166.34	.....	.....
Sauk	20	14,091.02	1	510.00	.....	.....	21	14,601.02	5	7,000.00
Sawyer .....	.....	.....	.....	.....	2	2,519.00	2	2,519.00	.....	.....
Shawano	6	13,518.17	6	3,579.87	7	4,338.93	19	21,431.97	1	2,800.00
Sheboygan	5	5,891.86	6	6,974.15	1	710.89	12	13,076.40	2	9,623.00
Taylor	3	2,233.00	1	689.00	.....	.....	4	2,922.00	.....	.....
Trempealeau	14	16,339.75	2	1,360.00	10	17,316.00	26	35,015.75	.....	.....
Vernon	30	23,188.10	11	12,066.60	8	26,742.18	49	61,948.88	2	5,200.00
Vilas	1	6,588.00	.....	.....	.....	.....	1	6,588.00	2	2,500.00
Walworth	8	8,788.07	4	3,253.00	.....	.....	12	11,991.07	.....	.....
Washburn	2	4,522.00	.....	.....	.....	.....	2	4,522.00	.....	.....
Washington	4	2,710.00	.....	.....	1	800.00	5	3,510.00	1	1,200.00
Waukesha	6	4,601.30	6	18,323.23	.....	.....	12	22,924.53	.....	.....
Waupaca	2	1,165.00	.....	.....	.....	.....	2	1,165.00	.....	.....
Wausara	1	747.40	2	1,829.00	4	3,600.00	7	6,176.40	1	1,485.00
Winnebago	4	2,554.32	4	4,639.70	5	44,049.58	13	51,233.60	1	1,500.00
Wood	19	17,753.92	5	2,423.57	6	10,704.46	30	30,891.95	4	14,000.00
Totals	840	\$396,220.78	313	\$461,715.54	218	\$420,070.64	1371	1,778,006.96	124	\$254,394.00
Average cost per bridge .....	.....	\$1,066.98	.....	\$1,475.13	.....	\$1,926.93	.....	\$1,296.87	.....	\$2,051.56

TABLE XIX.

COUNTY AID BRIDGE CONSTRUCTION.

Showing by counties the number and cost of County Aid bridges constructed during the calendar years 1911 to 1915, inclusive, the same information by years for the calendar years 1916 and 1917, a grand total for the calendar years from 1911 to 1917 inclusive, and an estimate for the year 1918. These bridges have been constructed on special plans furnished by the State Highway Commission or on its standard designs. During the years from 1911 to 1917 inclusive, the estimate includes only those bridges actually designed with plans on file with the State Highway Commission. There were many others built of which the Commission has no knowledge, principally small bridges constructed from its standard designs. The estimate for 1918 is based on reports furnished by the county officials and includes all bridges on which County Aid has been paid. This explains the apparent increase in number and decrease in average cost for 1918 over 1917, at which time (1918), due to labor and material difficulties, construction actually decreased greatly in quantity and increased slightly in cost. See Table XVIII, State Aid bridges, for corresponding figures.

County	Total 1911 to 1915 inclusive		1916		1917		Grand total 1911 to 1917 inclusive		Estimate for 1918	
	No.	Estimated cost	No.	Estimated cost	No.	Estimated cost	No.	Estimated cost	No.	Estimated cost
Adams	2	\$2,580	2	\$1,598	4	\$4,178	2	\$2,584		
Ashland	8	7,825	2	3,350	10	11,175				
Barron	35	38,247	13	18,102	11	\$23,508	59	79,857	17	16,500
Bayfield	6	10,390	3	5,750	2	4,200	11	20,340	2	2,000
Brown	25	22,825	11	12,050	12	15,100	48	49,975	35	30,000
Buffalo	10	14,298	4	3,700	3	5,150	17	23,148	14	12,552
Burnett	10	12,967	3	6,900	7	12,150	20	31,617	6	6,000
Oaunet	13	12,250	2	2,150	8	23,800	23	37,700	15	34,000
Chippewa	30	35,774	6	6,050	10	32,125	46	73,949	18	21,718
Clark	9	6,861	6	6,900	2	4,250	17	18,011	10	5,039
Columbia	10	6,384	3	3,900	2	1,925	15	12,209	5	3,500
Crawford	11	11,702	1	1,250	12	18,012	12	18,012	8	17,582
Dane	82	78,630	33	27,454	13	13,067	128	119,151	18	21,000
Dodge	3	3,300			1	1,000	4	4,300		
Door	3	3,000			1	500	4	3,500	5	2,000
Douglas	8	16,886	4	7,326	4	13,524	16	37,736	2	3,890
Dunn	20	22,422	8	8,708	9	8,270	37	39,400	10	12,000
Eau Claire	43	41,240	12	10,500	10	14,246	65	65,986	8	14,000
Florence	3	9,596			3	9,596	3	9,596	1	19,225
Fond du Lac			1	960	2	2,400	3	3,350		
Forest	3	7,250	4	10,650			7	17,900	2	3,100
Grant	21	15,852	4	5,290	5	10,445	30	31,600		
Green	26	24,120	4	3,450			30	27,570	10	19,500
Green Lake					4	5,500	8	8,050	1	2,044
Iowa	4	2,550								
Iron	4	8,580	1	1,469			5	10,049	1	1,036
Jackson	21	46,737	3	7,095	3	4,950	29	58,419	9	8,000
Jefferson	19	23,149	7	4,510	3	3,550	29	31,209		
Juneau	8	9,300	5	3,414	3	3,950	16	16,664		
Kenosha	9	6,729	5	6,225	3	2,400	17	15,354	3	3,000
Kewaunee	16	21,970	10	4,986	20	26,490	46	54,678	14	24,750
La Crosse	68	71,063	7	8,378	15	22,750	90	102,092	26	21,190
La Fayette	35	28,415	10	9,978	15	21,410	60	59,101	14	15,000
Langlade	5	7,287	2	14,851	3	4,200	10	26,338	3	3,275
Lincoln	34	42,525	6	8,254	10	11,900	50	62,379	2	4,418
Manitowoc	43	45,887	19	16,750	17	25,000	79	87,137	31	45,000
Marathon	16	20,212	4	3,400	2	18,950	22	42,562	28	40,280
Marquette	7	10,474	1	2,800	1	3,500	9	16,774	1	1,600
Marquette	2	7,837	1	800	2	1,800	5	9,967	2	1,000
Milwaukee	7	12,020	1	1,250	4	16,400	12	29,670	3	3,000

TABLE XIX—Continued.

County	Total 1911 to 1915 inclusive		1916		1917		Grand total 1911 to 1917 inclusive		Estimate for 1918	
	No.	Estimated cost	No.	Estimated cost	No.	Estimated cost	No.	Estimated cost	No.	Estimated cost
Monroe	12	11,172	21	19,800	16	27,572	49	58,544	25	31,000
Oconto	26	38,285	12	15,900	10	9,850	48	64,015	13	12,369
Oneida	14	19,500	2	1,468	3	9,650	19	30,618	1	1,900
Outagamie	1	26,400	15	22,620	6	9,450	22	58,530	37	51,800
Ozaukee	9	12,405	5	4,450	2	7,900	16	24,755	2	5,500
Pepin	20	25,735	2	5,000	5	5,350	27	36,085	5	9,300
Pierce	57	48,830	34	31,450	26	34,800	117	114,580	12	17,716
Polk	5	2,893	3	1,950	2	2,200	10	7,043	3	2,190
Portage	16	9,490	4	3,250	3	3,800	23	16,540	1	1,340
Price	6	8,350			1	750	7	9,100	6	10,800
Racine	11	15,474	2	650			13	16,124	3	2,000
Richland	10	9,632	3	13,137	7	11,920	20	34,689	7	17,145
Rock	17	12,436	7	10,218	6	6,750	30	29,404	2	2,000
Rusk	43	44,198	8	6,343	7	11,895	58	62,426	2	2,800
St. Croix	39	32,070	14	16,406	8	7,000	61	55,476	4	1,435
Sauk	15	12,575	7	5,970	4	4,600	26	23,145	1	1,500
Sawyer	10	26,971	4	6,800	2	2,300	16	36,071	6	10,000
Shawano	42	37,646	16	17,250	9	9,650	67	64,546	17	17,853
Sheboygan	16	19,225	7	11,680	5	15,050	28	45,935	5	11,183
Taylor	3	4,450	1	500	2	2,300	6	7,550	10	13,050
Trempealeau	50	49,317	16	14,700	3	11,970	71	75,987	20	24,000
Vernon	12	9,164	2	6,500			14	15,664	23	50,000
Vilas	4	2,833	1	2,350			5	5,683	2	12,000
Walworth	7	6,386			2	10,870	9	17,556		
Washburn	7	10,118	1	650	1	6,800	9	17,568	2	1,200
Washington	6	3,765			1	5,000	7	8,765	1	800
Waukesha	15	12,450	6	4,500	5	6,650	26	23,600		
Waupaca	26	22,381	8	5,400	2	5,900	36	34,131		
Waushara	2	1,300	5	3,068	6	4,606	13	9,963		
Winnebago	7	5,650	3	2,810	3	7,550	13	16,010	4	7,200
Wood	5	5,400	2	3,300	5	7,000	12	15,700	1	1,200
Totals	1194	\$1,316,011	424	\$179,228	359	\$606,870	1977	\$2,401,109	546	\$739,572
Average cost per bridge		\$1,102		\$1,130		\$1,687		\$1,215		\$1,354

TABLE XX.

AVERAGE UNIT COST OF WORK.

Showing the average unit costs of performing various kinds of construction in theseveral counties in 1914, 1915, 1916 and 1917.

County	Excavation per cubic yard				Concrete in Culverts per cubic yard				Crushed Stone Macadam, per square yard				Crushed Gravel Macadam, per square yard				Cement Concrete per square yard				Guard Rail per linear foot			
	1914	1915	1916	1917	1914	1915	1916	1917	1914	1915	1916	1917	1914	1915	1916	1917	1914	1915	1916	1917	1914	1915	1916	1917
	\$0.34	\$0.28	\$0.30	\$0.19	\$7.81	\$6.58			\$0.79	\$0.79	\$0.78	\$0.79									\$0.21	\$0.18		\$0.12
Adams .....	.58	.54	.62	.50	14.78	8.28	10.63	\$11.94																.14
Ashland .....	.34	.32	.26	.26	8.83	9.07	12.53														.29	.08		.22
Barren .....	.25	.25	.40	.16	15.20	11.06	10.00	14.12																
Bayfield .....	.30	.26	.34		7.51	7.75	10.90	15.12	.54	.62	.52	.77	\$0.44				\$1.25	\$1.03	\$1.70		.25	.24		
Brown																								
Buffalo .....	.26	.27	.27	.27	9.50	7.97	8.25	10.57	.59	.57	.56	.68					1.88				.19	.17	.24	.31
Burnett .....	.28	.22	.18		8.06	5.88	9.80	10.50										1.21	1.83					
Calumet .....	.36	.35	.41	.55	8.85	6.37	10.38		.88	.42	.52	.46	.52				1.30				.18			
Chippewa .....	.35	.35	.35	.35	37.11	8.69	8.66	10.85	.54	.51	.54	.51	.41	.27							.14	.14		.19
Clark .....	.28	.26	.22	.28	8.48	6.24	8.19	10.55	.54	.54	.55		.57								.16		.12	
Columbia .....	.30	.29	.40	.40	5.55	6.53	7.80	9.85	.53	.68	.45	.45	.29	.24			1.16	1.35	1.47		.10	.18	.21	
Crawford .....	.33	.31	.30	.35	6.55	6.61	7.00	12.10	.72	.58	.56	.74	.47	.48			1.21	1.33	1.30		.28	.25	.22	.15
Dane .....	.40	.35	.32	.39	7.96	6.47	7.27	11.10	.52	.58	.56	.74	.47	.48			1.30	1.30						
Dodge .....	.33	.32	.30	.36	7.29	6.55	7.75	9.68	.51	.40	.52	.53	.34	.35			1.31	1.30					.39	.21
Door .....	.30	.20	.33	.43	3.90	8.30	7.87	9.10	.30	.32	.32	.44									.25			.48
Douglas .....	.40	.38	.34	.39	12.37	10.98	12.34	10.70	.80	.80	.49		.37				1.39				.16	.31	.17	.21
Dunn .....	.26	.27	.24	.29	6.83	6.93	7.20	9.30	.79	.48											.23	.22	.25	.27
Eau Claire .....	.25	.34	.24	.29	9.81	6.04	8.46	10.60	.79	.48								1.20	1.25	1.53	.17	.15	.24	.26
Florence .....				.29				11.00					.47											
Fond du Lac .....	.47	.46	.56	.58	7.70	7.10	8.56	9.07	.50	.52	.73	.85	.43	.37			1.30	1.25				.14		.44
Forest .....	.35	.35	.36	.40	9.80	8.57	9.75	8.32													.20	.13		
Grant .....	.41	.36	.37	.36	10.00	8.29	8.00	11.25	.57	.58	.61	.64	.58	.54			1.14		1.09		.22	.19	.22	.29
Green .....	.55	.52	.50	.50		8.27	9.58	12.00	.40	.37	.46	.61	.27	.41			1.45	1.49	1.53					.29
Green Lake .....	.35	.31	.26	.29	6.06	5.83	6.90	7.81	.58	.60	.52	.55												
Iowa .....	.41	.34	.36	.42	8.61	7.58	9.62	10.90	.63	.56	.68	.93					1.13	1.25			.16	.20	.26	.24
Iron																								
Jackson .....	.57	.52	.75	.44	11.24	7.70		14.65									1.15	1.02			.21	.15	.21	.29
Jefferson .....	.35	.35	.38	.38	.52	7.65	8.06	6.70	10.30	.47	.32		.19	.35						.32				
Juneau .....	.34	.29	.23	.23	.31	7.24	9.18	14.15	.57	.56	.65	.73								.26	.25	.12	.16	
Kenosha .....	.45	.39	.41	.54	9.31	7.47	9.42	10.46	.60	.58	.88		.36				1.25	1.16			.12	.20	.24	.25

TABLE XXI.

EXCAVATION, CULVERTS, SURFACING, GUARD RAIL.

Showing by counties, the quantities of each of the more important items of construction in the years 1916 and 1917.

County	Excavation, cubic yards		Concrete in culverts, cubic yards		Permanent surfacings—all types—square yards		Guard rail, linear feet	
	1916	1917	1916	1917	1916	1917	1916	1917
Adams	3,714	4,860			9,169	5,663		900
Ashland	30,373	28,025	286.3	20.0	58,500	77,966		984
Barron	67,955	54,460	528.9	391.3		7,466	2,232	4,085
Bayfield	32,299	22,960	391.8	154.5				
Brown	23,995	18,900	284.7	147.3	37,290	29,307	2,725	
Buffalo	49,000	38,490	312.4	276.7	35,544	30,429	11,611	4,170
Burnett	54,000	25,000	80.3	80.0	13,255	2,338		
Calumet	11,140	2,000	195.8	63.3	22,856	4,100		
Chippewa	35,605	25,270	253.6	255.4	47,180	66,700		1,872
Clark	57,063	30,182	425.8	248.6	91,657	94,093	2,130	
Columbia	57,000	59,017	750.0	866.6	124,007	130,021	1,690	
Crawford	36,211	10,159	253.5	47.5	4,250	2,100		2,000
Dane	109,700	97,800	1,390.0	830.0	133,281	85,068	8,272	2,112
Dodge	45,953	25,064	601.7	633.3	113,773	91,033	1,710	1,868
Door	38,900	34,163	211.0	196.0	66,080	76,956		295
Douglas	180,121	84,167	1,285.0	472.2	30,882	19,580	3,402	5,922
Dunn	32,744	40,188	295.5	308.5	47,409	64,752	2,271	4,160
Eau Claire	43,454	51,000	465.5	185.9	60,188	46,612	5,681	3,720
Florence		20,000		22.8	14,290	5,200		
Fond du Lac	20,686	18,680	579.8	263.7	41,115	41,600		808
Forest	67,919	108,280	260.3	226.6		2,125		
Grant	105,000	112,300	1,000.0	941.3	44,633	19,693	8,700	10,605
Green	60,000	36,600	416.0	389.2	73,285	48,148		1,897
Green Lake	13,793	12,795	186.0	159.9	31,433	31,010		
Iowa	29,000	15,875	388.0	395.3	13,052	9,269	2,486	1,565
Iron	35,420	31,080		150.2	19,778	16,300		
Jackson	49,100	30,150	489.8	286.2	27,874	23,143	1,140	2,786
Jefferson	54,000	38,000	360.0	288.5	68,071	70,415		
Juneau	39,295	33,200	276.3	244.9	37,269	20,102	1,062	1,324
Kenosha	21,759	20,618	229.8	419.3	36,911	71,476	1,368	160
Kewaunee	21,300	12,776	324.3	238.9	34,700	33,680	180	
La Crosse	52,272	29,489	532.6	695.7	76,657	58,372		
Lafayette	33,952	23,007	500.9	336.8	2,420		2,403	1,189
Langlade	53,201	80,700	216.4	252.3	16,000		3,776	6,558
Lincoln	96,000	39,000	313.0	105.3	26,823	50,120		1,570
Manitowoc	30,160	11,960	487.2	348.2	63,898	36,200		
Marathon	49,499	36,615	180.8	265.8	25,418	35,321	888	653
Marquette	70,351	39,963	309.1	178.7	50,685	68,530	470	275
Marquette	16,442	14,565	124.7	100.8	40,193	36,020	144	399
Milwaukee	135,156	120,610	1,913.0	1,787.7	255,585	235,908	10,640	4,338
Monroe	41,415	40,900	622.2	640.0	58,952	45,155	4,564	
Oconto	26,100	31,384	176.2	419.5	32,480	49,100	600	175
Oneida	93,486	156,500	155.9	219.3	25,838	19,406	7,449	2,953
Ozaukee	51,110	36,565	842.8	1,492.4	129,293	151,084		1,421
Ottawa	10,322	11,064	217.5	115.6	35,499	28,652		1,508
Pepin	17,505	48,300	126.0	49.9	16,871	25,204	77	822
Pierce	58,300	22,234	317.7	252.8	20,869	47,638	912	1,044
Polk	82,454	73,095	568.9	308.4	36,976	11,300	4,100	
Portage	24,770	22,045	155.9	123.7	80,836	31,840	464	
Price	66,465	60,630	30.7	251.5	7,560	17,993	700	

TABLE XXI—Continued.

County	Excavation, cubic yards		Concrete in cul- verts, cubic yards		Permanent surfac- ings—all types— square yards		Guard rail, linear feet	
	1916	1917	1916	1917	1916	1917	1916	1917
Racine	19,397	26,600	415.3	199.1	70,529	48,610	362	630
Richland	12,300	9,000	286.0	101.2	24,506	2,079	7,475	763
Rock	50,000	68,500	288.6	283.5	169,446	160,163	.....	.....
Rusk	17,760	7,000	38.8	.....	17,416	.....	1,390	.....
St. Croix	58,065	39,015	452.3	272.9	87,193	33,894	2,184	7,755
Sauk	36,665	42,380	320.0	496.6	92,001	67,474	3,200	80
Sawyer	25,991	56,106	50.0	30.1	.....	.....	135	.....
Shawano	32,900	29,800	295.5	288.7	41,446	44,080	64	536
Sheboygan	38,086	40,306	481.3	186.0	57,712	41,564	1,917	2,350
Taylor	35,530	35,990	55.5	162.4	3,900	47,510	290	550
Trempealeau....	64,600	91,994	333.7	311.9	78,110	23,966	2,864	6,814
Vernon	71,000	63,000	623.0	420.0	24,055	6,553	2,100	.....
Vilas	51,355	31,285	.....	.....	.....	.....	.....	.....
Walworth	17,500	34,731	285.2	153.2	46,004	32,064	1,128	828
Washburn	50,330	33,330	106.3	11.0	.....	41,420	360	.....
Washington ...	14,067	12,065	158.0	65.5	22,220	31,544	.....	752
Waukesha	24,387	25,065	287.0	241.9	63,683	85,330	.....	.....
Waupaca	55,806	27,866	469.6	136.4	117,006	48,580	642	250
Waushara	18,250	22,717	134.3	96.6	37,256	52,445	.....	1,549
Winnebago	12,728	1,540	189.4	47.4	23,929	25,307	.....	.....
Wood	72,100	42,400	307.0	262.4	30,920	30,013	2,946	944
Totals.....	3,165,236	2,782,177	25,810.4	21,377.1	3,348,516	3,047,386	120,844	95,964

TABLE XXII.

Showing by counties, the total mileage of rural highways, the mileage on the Prospective State Highway System, and on the State Trunk Highway System, the ratio of each to the total mileage, the mileage and percentage of highways improved under State Aid laws on the Prospective State Highway System, and an estimate of total mileage surfaced and the ratio of surfaced mileage to the total.

County	Total mileage rural public highways	Prospective state highway system		State trunk highway system		Improvements on prospective state highway system		Estimated total of surfaced roads of all types	
		Mileage	Percentage of total mileage	Mileage	Percentage of total mileage	Mileage improved	Percentage of system improved	Mileage	Percentage of total rural highways surfaced
Adams	1,116	304	27.4	73.93	6.62	19	6.2	40	4
Ashland	523	118	22.3	84.56	16.00	95	80.4	130	24
Barron	1,616	345	21.4	90.96	5.62	117	33.6	45	28
Bayfield	927	197	21.3	96.01	10.35	75	38.1	5	.....
Brown	1,073	336	36.0	70.11	6.53	115	29.7	465	43
Buffalo	1,007	281	27.9	99.28	9.91	52	18.5	75	7
Burnett	1,211	190	15.7	39.41	3.24	56	29.4	70	6
Calumet	637	167	26.2	63.15	9.90	26	15.6	425	67
Chippewa	1,323	332	25.9	86.32	6.43	68	17.8	250	22
Clark	1,662	441	26.6	80.53	4.85	157	35.6	185	11
Columbia	1,342	485	36.2	98.24	7.32	142	29.1	400	30
Crawford	1,084	208	19.2	65.95	6.10	24	11.3	20	2
Dane	2,250	753	33.1	157.54	7.00	217	28.7	605	27
Dodge	1,592	447	28.1	95.14	5.59	136	30.3	690	43
Door	961	233	23.7	40.83	4.16	105	45.0	400	41
Douglas	1,075	250	23.4	62.40	5.83	113	45.2	90	8
Dunn	1,487	345	23.3	42.78	2.88	49	14.2	160	11
Eau Claire	1,005	183	18.2	83.15	8.31	55	29.9	230	27
Fond du Lac	231	70	30.3	34.35	14.30	45	64.0	95	41
Forest	1,298	303	23.5	84.19	6.50	67	22.0	610	47
Grant	402	200	50.0	63.44	15.30	118	56.0	5	1
Green	2,071	751	36.3	111.16	5.36	90	12.0	230	16
Green Lake	1,069	405	38.2	56.49	5.31	101	25.0	315	30
Iowa	569	135	23.7	46.76	8.20	32	23.5	155	27
Iron	1,141	313	27.5	66.12	5.90	49	15.6	50	4
Jackson	214	105	49.0	53.76	25.10	73	69.5	35	17
Jefferson	1,487	353	24.2	65.60	4.46	108	28.5	195	13
Juneau	908	841	37.6	79.14	7.92	94	27.5	355	39
Kenosha	1,235	841	27.7	85.32	6.93	76	22.3	95	8
Kewaunee	487	158	32.5	35.67	7.36	72	45.3	235	50
La Crosse	725	192	26.5	52.32	7.21	38	19.7	345	48
Lafayette	722	230	31.8	48.98	6.77	95	41.2	195	27
Langlade	1,147	309	32.4	66.76	5.85	68	18.4	45	4
Lincoln	757	194	25.6	32.18	4.28	98	48.0	55	7
Manitowoc	764	254	33.3	41.36	5.40	141	55.5	110	14
Marathon	1,277	239	18.8	75.70	5.96	69	28.7	810	64
Marquette	2,267	527	23.3	107.66	4.77	112	21.0	135	8
Milwaukee	1,343	262	19.5	61.20	4.56	130	49.2	245	18
Monroe	753	191	25.2	40.09	5.44	36	18.8	140	19
Outagamie	513	219	42.4	69.33	13.50	159	72.6	465	91
Ozaukee	1,373	474	34.6	75.13	5.48	56	18.2	175	13
Oconto	1,165	285	24.6	67.60	5.33	84	29.5	235	25
Oneida	754	242	32.1	116.08	15.40	167	69.0	60	8
Osage	1,158	249	21.6	50.41	4.38	105	42.1	420	37
Osaukee	496	128	25.8	34.50	6.96	21	16.6	415	84

TABLE XXII—Continued.

County	Total mileage rural public high- ways	Prospective state highway system		State trunk highway system		Improvements on prospective state highway system		Estimated total of surfaced roads of all types	
		Mileage	Percent- age of total mileage	Mileage	Percent- age of total mileage	Mileage im- proved	Percent- age of system im- proved	Mileage	Percent- age of total rural high- ways surfaced
Pepin	420	111	26.4	26.90	6.40	19	17.2	55	13
Pierce	1,234	267	21.7	53.42	4.34	58	21.7	125	10
Polk	1,668	383	23.0	72.02	4.33	96	25.6	135	8
Portage	1,378	311	22.7	77.75	5.67	79	25.5	135	14
Price	868	236	27.2	83.24	9.60	144	61.0	15	2
Racine	607	191	31.5	65.31	10.85	66	34.5	365	63
Richland	1,196	304	25.5	76.69	6.44	55	18.0	95	8
Rock	1,312	432	33.0	80.71	6.16	210	48.4	315	62
Rusk	899	330	42.4	75.23	8.37	133	49.2	30	3
St. Croix	1,404	314	22.5	68.87	4.98	84	26.6	250	18
Sauk	1,571	444	28.3	106.55	6.75	139	31.1	330	25
Sawyer	614	176	28.7	61.14	9.96	65	36.7	10	2
Shawano	1,436	302	21.1	102.40	7.14	79	26.4	280	20
Sheboygan	1,122	217	19.4	68.69	6.13	79	36.7	565	51
Taylor	921	223	24.7	26.52	2.88	73	31.8	90	10
Trempealeau	1,243	315	25.4	91.27	7.35	94	29.8	200	16
Vernon	1,631	393	24.1	61.78	3.77	84	21.5	35	2
Vilas	450	145	32.2	59.86	13.30	107	73.1	30	6
Walworth	1,076	319	29.8	90.06	8.40	63	19.6	565	53
Washburn	1,053	261	24.8	75.65	7.20	61	23.5	10	1
Washington	946	190	20.1	62.56	6.61	35	18.5	590	63
Waukesha	1,122	301	26.9	71.81	6.49	74	24.5	715	64
Waupaca	1,494	322	21.6	81.57	5.47	99	30.8	410	27
Waushara	1,319	239	22.1	98.74	7.53	58	19.9	245	19
Winnebago	848	215	25.4	39.05	4.60	47	21.8	595	71
Wood	1,199	332	32.1	68.01	5.79	123	32.0	65	5
Totals	77,231	20,687	26.7	4,998.89	6.50	6,226	30.1	17,715	23

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